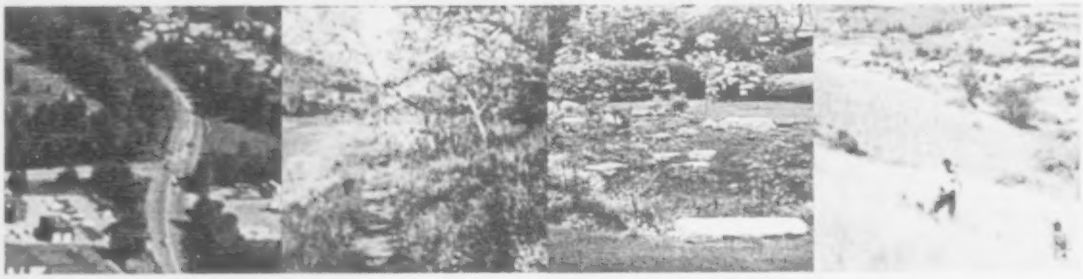
# Environmental Best Management Practices for Urban and Rural Land Development in British Columbia



June 2004

**The Ministry of Water, Land and Air Protection will be updating this document over time. We would really appreciate your comments and feedback to make this a more useful and user-friendly document. Please complete the questionnaire in Appendix 1-1**

BRITISH COLUMBIA
Ministry of Water, Land and Air Protection
Ecosystem Standards and Planning
Biodiversity Branch

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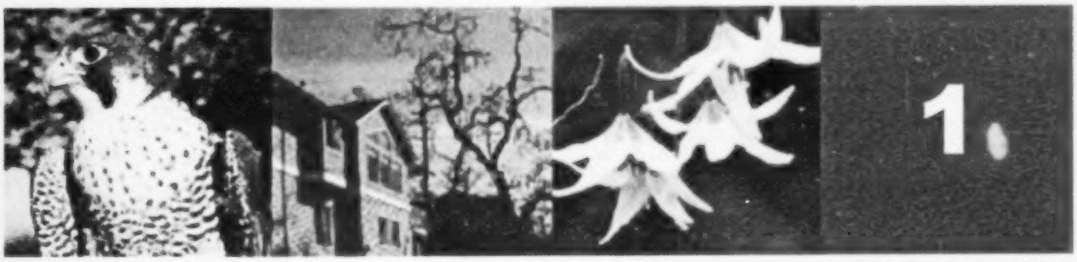
# Environmental Best Management Practices for Urban and Rural Land Development



June 2004

## Section One

## INTRODUCTION

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BRITISH COLUMBIA

Ministry of Water, Land and Air Protection
Ecosystem Standards and Planning
Biodiversity Branch

# Introduction

The *anatum* subspecies of Peregrine Falcon is red-listed in B.C.
PHOTO: NEIL DAWE

British Columbia is recognised globally for its exceptional wildlife, diversity of ecosystems and rich natural resources. The Ministry of Water, Land and Air Protection helps to maintain these valuable natural assets, which provide the essentials of life as well as recreational and economic activities enjoyed by British Columbians in all regions of the province.

Rapid urbanisation, especially in the southern areas of the province, continues to have significant impacts on the natural environment, including alteration of habitats and an increase in the number of plant and animal species "at risk". For more information on the state of the natural environment in British Columbia, see *Environmental Trends in British Columbia 2002*.

**ECOSYSTEMS: ESSENTIAL TO LIFE**

"[Ecological] systems provide the basic elements essential to life: fixation of solar energy; protection against harmful cosmic influences; regulation of the chemical composition of the atmosphere; operation of the hydrological cycle; water catchment and groundwater recharge; regulation of local and global climate and energy balance; formation of topsoil and maintenance of soil fertility; prevention of soil erosion and sediment control; food production by food webs; biomass production; storage and recycling of nutrients and organic matter; assimilation, storage and recycling of waste; maintenance of habitats for migration and nursery; maintenance of the scenery of the landscape and recreational sites; and provision of the historical, spiritual, aesthetic, educational, and scientific information and cultural and artistic inspiration." (*Dale 2001, citing Costanza and Folke 1996*)

**FREE SERVICES**

"Ecosystems regulate our climate, clean our fresh water, regulate and clean atmospheric gases, maintain genetic diversity, sustain the water cycle, recycle nutrients, and pollinate our crops. Simply put, at no cost to us, ecosystems provide the services that allow us to live on the Earth." (*McPhee et al. 2000*)

## 1.1 PURPOSE OF DOCUMENT

The Ministry of Water, Land and Air Protection has prepared *Environmental Best Management Practices for Urban and Rural Land Development* to assist people who are involved in planning, implementing, reviewing and/or approving land developments in British Columbia's urban and rural areas. Its primary purpose is to provide province-wide guidelines for the maintenance of environmental values during the development of urban and rural lands. It also provides information on ways that environmental protection and stewardship can benefit the community, the property owner and the developer, as well as the natural environment.

This Best Management Practices document is one in a series of best management practices documents prepared by the Ministry of Water, Land and Air Protection. For a complete listing of titles available, see the Ministry website http://wlapwww.gov.bc.ca/wld/BMP/bmpintro.html.

### 1.1.1 Scope

This document applies to land development in urban, suburban and rural areas throughout British Columbia. It has not been written for forestry, mining, or commercial agriculture on Agricultural Land Reserves, although some of the best management practices may apply to these areas.

**THIS DOCUMENT IS WRITTEN FOR:**

- Local government decision-makers
- Planners
- Engineers
- Architects
- Developers
- Landscape architects
- Land surveyors
- Landowners
- Approval officers
- Parks & recreation administrators
- Public works administrators
- Real estate agents
- Others involved in land development decisions

'Development' as discussed in this publication includes:

- Development and/or re-development of urban or rural lands;
- 'Greenfield' developments—those on lands not previously built on (this may include resource lands formerly used for forestry or agriculture);
- 'Brownfield' developments—those on lands that have been previously developed (e.g. former mine sites, abandoned industrial or commercial sites).

There are many types of 'development' that are subject to local government or provincial agency regulation, including residential, commercial, industrial, institutional or ancillary activities that are subject to the *Land Title Act*, *Community Charter* or *Local Government Act*. 'Developments' range from commercial and residential developments, to public works and parks projects, the construction of buildings or flood protection works, development of campgrounds and any other activities that affect the natural landscape.

## 1.2 NAVIGATING THE BEST MANAGEMENT PRACTICES DOCUMENT

*Environmental Best Management Practices for Urban and Rural Land Development* is presented in eight major sections:

**Section 1: Introduction and Summary** provides an overview of the document and an introduction to its purpose.

**Section 2: A Shared Responsibility** describes the Ministry's approach to shared stewardship and results-based management.

**Section 3: Environmental Planning at the Community Level** focuses on the roles of local governments and other approval agencies in planning at a community level, and providing the foundation for good environmental planning at the site level.

**Section 4: Environmental Planning and Development at the Site Level** describes the objectives, requirements and best management practices for good environmental planning at the site level.

**Section 5: Environmentally Sensitive Areas** describes the objectives, requirements and best management practices for land development near environmentally sensitive areas.

**Section 6: Special Wildlife and Species at Risk** describes the objectives, requirements and best management practices for land development where these species are or may be present.

**Section 7: Aquatic and Riparian Ecosystems** describes the objectives, requirements and best management practices for land development where aquatic or riparian ecosystems are present.

Housing development in a Garry Oak meadow
PHOTO: MARLENE CASKEY

**Section 8: Pollution Prevention** includes a number of sub-sections that address specific concerns for the prevention of environmental harm. These sections are:

- Dealing with Contaminated Sites
- Pesticides
- Liquid Waste
- Air Quality
- Water Quality
- Spill Containment and Reporting
- Groundwater and Wells
- Solid Waste
- Climate Change and

**Appendix A: Benefits of Environmental Protection** describes some of the many benefits of environmental protection for local governments, developers and the community.

**Appendix B: Sources for Environmental Mapping and Inventory** identifies some of the sources for mapping and inventory information.

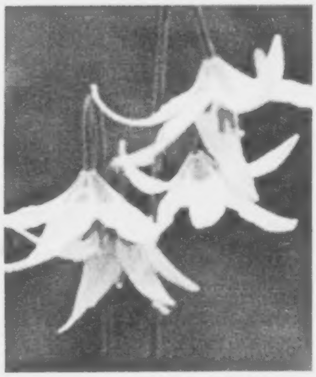
**Appendix C: Terms of Reference for Bio-inventory** provides suggested terms of reference for bio-inventory work.

The different sections have been colour coded for ease of navigation.

For people using this document on-line, it has been extensively hyperlinked for easy access to the many other sources referred to in the text. These web links and references to other documents are provided in "Useful Sources" found at the end of each Section, and in the **Bibliography**.

While the Ministry has made an effort to minimise the use of technical terms, we have provided some section-specific definitions at the end of each Section for words shown in brown, and a **Glossary** in the appendices.

You can contact staff in provincial Ministries throughout the province at no charge by calling Enquiry BC. Hours of operation for Enquiry BC are 7:30 a.m. to 5 p.m. — Monday through Friday.
In Victoria call: 387-6121
In Vancouver call: 604 660-2421
Elsewhere in BC call: 1 800 663-7867
Outside British Columbia: 604 660-2421
E-mail address: EnquiryBC@gems3.gov.bc.ca

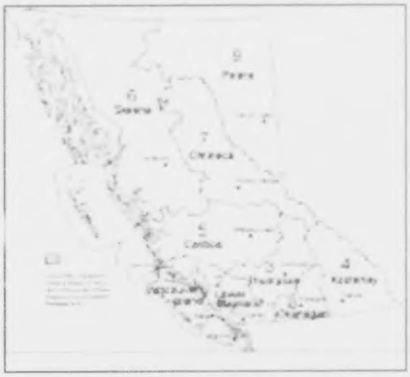


White fawn lily.
PHOTO: MARK KAARREMAA

## 1.3 FOR FURTHER INFORMATION

For more information on other Best Management Practices documents in this series, or other Ministry business, please go to http://wlapwww.gov.bc.ca or contact your nearest Ministry office:

Vancouver Island Region
Lower Mainland Region
Thompson and Okanagan Regions
Kootenay Region
Cariboo Region
Skeena Region
Omineca and Peace Regions
Okanagan Region



## 1.4 TELL US WHAT YOU THINK

This Best Management Practices document has been designed to provide guidance to local governments, individuals and companies that are planning any form of land development or re-development. We will be updating and improving this document over time.

In order to help us make this document work well for YOU, please take the opportunity to fill in the feedback form in Appendix 1-1. Please send your comments to:

Attn: Bob Cox, External Liaison Officer
Biodiversity and Wildlife
B.C. Ministry of Water, Land and Air Protection
PO Box 9338, Stn Prov Govt
Victoria BC  V8W 9M1
E-mail: Bob.Cox@gems5.gov.bc.ca

## APPENDIX 1-1: FEEDBACK FORM

Name:________________________________________

Organisation:____________________________________

E-mail address (or phone number):________________________

Address (please provide city and postal code):

City:____________________Postcode:____________________

**Which sections of the *Environmental Best Management Practices for Urban and Rural Land Development* did you use?**

☐ All sections or: (*please check all that apply*)
☐ Section 1: Introduction and Summary
☐ Section 2: A Shared Responsibility
☐ Section 3: Environmental Planning at the Community Level
☐ Section 4: Environmental Planning at the Site Level
☐ Section 5: Environmentally Sensitive Areas
☐ Section 6: Special Wildlife and Species At Risk
☐ Section 7: Aquatic and Riparian Ecosystems
☐ Section 8: Pollution Prevention
  - ☐ Dealing with Contaminated Sites
  - ☐ Spill Containment and Reporting
  - ☐ Pesticides
  - ☐ Groundwater and Wells
  - ☐ Liquid Waste
  - ☐ Solid Waste
  - ☐ Air Quality
  - ☐ Climate Change

☐ Appendix A: Benefits of Environmental Protection
☐ Appendix B: Sources for Environmental Mapping and Inventory
☐ Appendix C: Terms of Reference for Bio-inventory

**Did you find this Best Management Practices document helpful? Why? Why not?**

**Is the level of detail in this document**

☐ About right ☐ Too detailed ☐ Not detailed enough?

Comments:

**How could we make this document more usable/user-friendly?**

**Are there recommended best management practices that you feel are inappropriate? Why?**

**Do you have suggestions for additional best management practices to include?**

**Do you have suggestions for additional sections/topics to include?**

**Do you have examples of community planning or site developments that have modelled best management practices? Please provide a contact name for more information.**

**Other comments and suggestions:**

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# Environmental Best Management Practices for Urban and Rural Land Development

2

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## Section Two

## A SHARED RESPONSIBILITY

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BRITISH COLUMBIA
Ministry of Water, Land and Air Protection
Ecosystem Standards and Planning
Biodiversity Branch

# A Shared Responsibility

## 2.1 SHARED STEWARDSHIP AND PARTNERSHIPS

The Ministry of Water, Land and Air Protection has signed memoranda of understanding with more than 52 municipalities and regional districts describing how these partners will share stewardship of the environment.

A healthy natural environment is the foundation for British Columbia's economy and quality of life.

The mandate of the Ministry of Water, Land and Air Protection (WLAP) is to protect and enhance the quality of British Columbia's water, land and air in a way that contributes to healthy communities, recreational opportunities, a sustainable environment, and the economic well being of the province. The Ministry shares this responsibility with all British Columbians who are taking an active part in maintaining the health of our environment.

The Ministry is expanding its partnerships with all levels of government including First Nations, as well as community organisations, academic institutions, businesses and industries, and citizens. These partners bring their local knowledge, resources, legislative authorities and expertise to the stewardship of British Columbia.

Those who undertake urban and rural land development bear a special responsibility to ensure that the choices they make benefit the current and future generations of people, plants and animals of British Columbia. The Ministry's results-based approach provides information to help guide those choices (through the Best Management Practices documents) and the independence to achieve the environmental objectives in the most appropriate manner.

Pine siskin on thistle.
PHOTO: DAVE POLSTER

## 2.2 A RESULTS-BASED APPROACH

The results-based approach focuses on setting clear, reasonable environmental outcomes (objectives) with discretion as to how to achieve these outcomes. Provided the stated objectives are met, these environmental outcomes may be achieved by:

- Following the guidelines set out in the Ministry's best management practices documents; and/or
- Using innovative practices that address specific issues and circumstances.

The role of the *Best Management Practices* document is to clearly set out the Ministry's expectations and requirements and to provide recommendations (best management practices) that describe how these objectives might be met.

Accordingly, each section of this document identifies:

**Objectives:** The Ministry's objectives set out the expected outcomes. Clients have the opportunity to meet those expected outcomes in the manner most appropriate to their situation.

**Legal Requirements:** These are the regulatory standards that must be met for the development to be in compliance with the law.

**Best Management Practices:** The best management practices outlined in this document provide guidance on how those objectives might be achieved. These BMPs are based on scientific research or long term observation and are methods that the Ministry feels will generally best achieve the desired objectives. Beyond meeting legal requirements, local governments and developers may choose different approaches that suit their context to meet the objectives. The best management practices listed are provided as *recommendations* rather than *requirements*.

However, by following the guidelines set out in the various best management practices documents, the local government and developer can demonstrate *due diligence* (see box) in striving to meet the stated objectives.

PHOTO: MARK KAARREMAA

### RISK MANAGEMENT AND DUE DILIGENCE

Due diligence: the level of judgment, care, prudence, determination and activity that a person would reasonably be expected to undertake under certain circumstances

Risk: the chance of something happening that will have an impact on the achievement of objectives

A results-based approach offers benefits to land developers by providing opportunities for more creative approaches to meeting the Ministry objectives. This might be less expensive and/or less time-consuming for the developer and approval agency. However, in taking on these responsibilities, those involved in land development activities will also take on risk and should identify and develop strategies for managing this risk. When land development is not properly planned and implemented, the developer's risks include loss of profitability or the possibility of legal consequences resulting from improperly managed activities. Local governments risk impacts on existing municipal infrastructure and quality of life for residents, and may also risk legal consequences. In addition, long term environmental impacts may result.

Where there are environmental problems as a result of development, local governments and land developers may face legal action. If so, they may be expected to demonstrate that they have used due diligence to avoid or mitigate these problems. Demonstrating that they have followed the best management practices provided in this document will strengthen the 'due diligence' defence.

## 2.3 ENVIRONMENTAL MONITORING AND COMPLIANCE

The development, implementation and **monitoring** of best management practices are part of an ongoing cycle. Environmental monitoring can encompass a wide range of activities and levels of effort. For urban and rural land development, typical monitoring would include 'environmental condition' or 'effectiveness' monitoring. These processes measure the results achieved on the ground against the stated objectives. The results of monitoring are used by agency staff and operators alike to determine what changes to the best management practices would be necessary to better achieve the objectives. Failure to achieve objectives can be because the recommended best management practices were:

- inadequate or inappropriate;
- not implemented; or
- not implemented correctly.

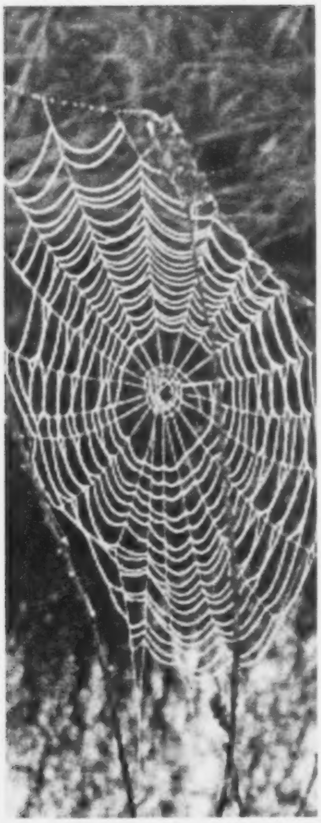

PHOTO: SYLVIA LETAY

Another important form of monitoring may be carried out by on-site environmental monitors. Where appropriate (such as on large scale developments or where there are sensitive habitats) proponents should employ on-site monitors to ensure environmental objectives and legal obligations are being met. Monitors must be qualified to deal with the issues and concerns which may occur on-site. To be effective, they must also have the authority to modify or alter activities or to stop work where necessary, until issues of potential or actual environmental damage are resolved. Effective use of on-site environmental monitors can contribute to a due diligence defence in the event that unforeseen environmental incidents occur.

**Compliance** monitoring will ensure compliance with appropriate legislation and regulations including permit, license and approval conditions. Compliance monitoring is generally carried out by the level of government responsible for the legislation, permit, license, etc. Staff from these agencies will work with the development community and others to improve performance where environmental or public safety goals and objectives are not being met or future environmental degradation is predicted.

## 2.4 FOR FURTHER INFORMATION

For further information on the Ministry's approach to results-based management, see the Ministry Service Plan at http://wlapwww.gov.bc.ca.

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## Section Three

# ENVIRONMENTAL PLANNING AT THE COMMUNITY LEVEL

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BRITISH COLUMBIA
Ministry of Water, Land and Air Protection
Ecosystem Standards and Planning
Biodiversity Branch

## Summary

Best management practices for environmental planning at the community level should set the framework for good environmental decisions at the site level. Best management practices for environmental planning include:

### COMMUNITY AND LANDSCAPE PLANS

- Select an appropriate scale for environmental planning
- Consider all aspects of the environment in community plans
- Identify areas of environmental value in community plans

### INVENTORY AND MAPPING

- Identify known environmentally sensitive areas and species at risk
- Conduct additional inventories to identify other important wildlife and habitat values
- Identify hazard lands

### APPROPRIATE DEVELOPMENT

- Locate development appropriately
- Avoid rural sprawl

### ECOSYSTEM AND SPECIES PROTECTION

- Retain large habitat reservoirs
- Retain habitat refuges
- Identify and set aside wildlife corridors
- Set buffers around sensitive areas
- Create incentives for natural habitat protection
- Enact bylaws to control pets

### ECOSYSTEM AND SPECIES RESTORATION AND ENHANCEMENT

- Develop restoration plans
- Take advantage of restoration opportunities offered by re-development
- Manage invasive species

### FLOOD AND TERRAIN HAZARD MANAGEMENT

- Assess and mitigate flood risk
- Identify and assess terrain hazards

### EROSION AND SEDIMENT CONTROL

- Control erosion and sediment

### WILDFIRE CONSIDERATIONS

- Address the possibilities of wildfire before permitting satellite developments
- Develop a plan to balance fire management and wildlife considerations

### WILDLIFE HUMAN CONFLICTS

- Consider wildlife-human conflicts when planning new developments

### STORMWATER MANAGEMENT

- Establish bylaws to encourage stormwater management

### LEAD BY EXAMPLE

- Demonstrate good environmental practices

### WORKING WITH LANDOWNERS AND DEVELOPERS

- Create a regulatory framework that promotes environmental protection and stewardship
- Ensure developments meet environmental standards
- Provide incentives for environmental protection and stewardship
- Promote the use of native species in landscaping
- Draw on local knowledge and expertise in the design of developments
- Educate landowners and developers about the benefits of environmental protection

# Environmental Planning at the Community Level

This section of *Environmental Best Management Practices for Urban and Rural Land Developments* is intended primarily for the benefit of **local governments**—regional districts and municipalities—and others (including First Nations) that are responsible for 'big picture' planning at a community-wide scale. Decisions made at the local government level are critical for the protection of **wildlife**[1] and **ecosystems**.

"Wildlife" includes all wild plants AND animals.

Community-level plans include plans that cover entire regional districts (e.g. regional growth strategies, regional **greenways** or regional parks plans), plans for all or part of a community (e.g. official community plans, local area plans and liquid waste management strategies), and plans for large sites (e.g. a comprehensive development plan for a major brownfield re-development). It also includes plans developed at a *landscape-level*—such as watershed-based plans, often developed by multi-partnered groups representing a variety of community interests.

This section addresses all of these 'big picture' plans that encompass an area much broader than the site-specific level, and which set the stage for effective environmental planning at the site level.

Environmental planning and development at the site level is discussed in Section 4: Environmental Planning and Development at the Site Level; Section 5: Environmentally Sensitive Lands; Section 6: Special Wildlife and Species at Risk; and Section 7: Aquatic and Riparian Ecosystems.

## 3.1 BENEFITS OF ENVIRONMENTAL PLANNING AT THE COMMUNITY LEVEL

Good environmental planning at the community level benefits people as well as the environment and wildlife.

- Developers benefit from greater certainty, cost savings and faster approvals.
- Residents benefit from a well planned community with clean air, clean water and a diversity of greenspace.
- Local governments benefit from greater community support, higher tax revenues, lower servicing costs and free ecosystem services

To learn more, see Appendix A: Benefits of Environmental Protection.

**THE IMPORTANCE OF LOCAL GOVERNMENT DECISIONS**

"The factors causing ecosystem decline, such as rapid urban development and habitat fragmentation, occur at the local level and are generated by local land use decisions (*Noss and Scott 1987*).

The vast majority of these decisions affecting large ecosystems will be made at a smaller scale, where they will make the largest impact on the natural environment (*Endter-Wada et al 1998, McGinnis et al 1999*).

As a result, many of the decisions that may threaten or protect natural habitat are in the hands of county commissioners, city councils, town boards, local planning staff, and the participating public. Thoughtful policies and actions at the local level can often protect critical habitats more effectively and less expensively than the best intentioned state or federal protection schemes (*Duerksen et al 1997*)". *From Brody et al 2003.*

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[1] **Definitions** are provided in Appendix 3-1 and in the Glossary

### COMMUNITIES BENEFIT FROM ENVIRONMENTAL PLANNING

- **Good for business:** "Land use planning strategies adopted initially for environmental concerns have been found not only to improve the local environment and living conditions, but also to attract business and increase economic value on the area" (*Quayle and Hamilton 1999*).
- **Lower costs:** "It can cost 70% more to provide infrastructure and services to low density suburbs than it does to re-develop an existing neighbourhood or to build on unused land" (*Curran and Leung 2000*). For local governments, the additional infrastructure would also add to the future maintenance costs.
- **Stormwater and flood management:** Retaining the natural stormwater balance of watersheds by protecting streams and wetlands and preserving natural riparian vegetation can avoid the need for expensive storm sewer infrastructure while reducing the risk of flooding and associated costs (*Sandborn 1996*)
- **Better air and water quality:** Trees and greenspaces improve air quality by removing pollutants and greenhouse gases (*Center for Urban Forest Research 2003*). Wetlands and riparian areas remove many pollutants before they reach streams (*McPhee et al 2000*).

**For more information, see** Appendix A: Benefits of Environmental Protection

## 3.2 OBJECTIVES

### THE MINISTRY'S GOALS ARE TO:

- Maintain and restore the ecological diversity of fish and wildlife species and their habitats; and
- Protect the environment and human health and safety by ensuring clean and safe water, land and air.

Environmental planning at the **community** or **landscape-level** should set the framework for good environmental decisions at the **site** level. Local governments should meet the following environmental objectives during urban and rural land development:

- Develop and implement community plans that promote sound environmental management, for the benefit of present and future residents and the flora and fauna of the community;
- Identify and plan for the long-term conservation and function of broad, landscape-level, ecological values, including:
  - all **environmentally sensitive areas** (terrestrial, aquatic and riparian ecosystems),
  - all known **species at risk** in the community, and
  - **wildlife corridors**;
- Protect and enhance environmentally sensitive areas, **habitat** for native plants and animals and species at risk, and wildlife corridors using bylaws, incentives and other planning tools;
- Identify areas where more sensitive development needs to occur;
- Direct community growth, development and re-development to areas with low environmental sensitivity;
- Protect residents and their property by siting developments away from areas subject to erosion, flooding, wildfires and undesirable human-wildlife encounters;

> "Conservation is an urban issue. More attention needs to be directed at urban municipalities with regard to land-use planning, transportation, major sources of air and water pollution, greenhouse gas emissions and entry points for invasive species." *WWF Nature Audit, 2003.*

- Prevent and manage deleterious effects on the air, water and land quality, through pollution prevention, management of stormwater, and waste management; and
- Work with the development community and other community interests to maximise the benefits of good environmental planning at the community and site level.

## 3.3 LEGISLATION

Official Community Plans can designate development permit areas for a variety of purposes, including "protection of the natural environment, its ecosystems and biological diversity." (*Local Government Act, s 919.1*)

The Community Charter and *Local Government Act* enable local governments (municipalities and regional districts) to plan for and control development within their jurisdiction.

The Community Charter states that the purposes of a municipality include "providing for stewardship of the public assets of its community," and "fostering the economic, social and environmental well-being of its community" (*Part 2, Section 7*). A council "may, by bylaw, regulate, prohibit and impose requirements in relation to:

- (c) Trees
- (j) Protection of the natural environment
- (m) The removal of soil and the deposit of soil or other material."

*(Community Charter, Part 2, Section 8).*

The Community Charter came into force in January 2004, replacing portions of the *Local Government Act* for municipalities, but a transition period allows for individual municipalities to adapt their bylaws.

The Community Charter does not currently apply to Regional Districts, which are governed by similar provisions of the *Local Government Act.*

There are many tools available to local governments to protect and enhance the natural environment. Some of the most frequently used tools are discussed in *Stewardship Bylaws: A Guide for Local Government* and include bylaws (tree protection bylaws, soil removal and deposit bylaws, watercourse protection bylaws, etc.), zoning and development permits.

Many other Acts and regulations apply to development at the site level. These are referenced in the later sections of this document.

## 3.4 BEST MANAGEMENT PRACTICES

Decisions by local governments, such as zoning or servicing decisions, affect the natural environment. The cumulative impact of many seemingly innocuous decisions can have a significant environmental impact, for better or for worse. Good community plans can avoid or minimise environmental issues before they occur.

### *3.4.1 Community and Landscape-level Plans*

Local governments may prepare a variety of plans including regional growth strategies, official community plans, park plans, greenways plans, integrated stormwater management plans, local area plans and other community-wide planning documents. These are usually based on political boundaries.

Landscape-level plans are those that address a geographical area with natural boundaries, such as a watershed plan, and the same best management practices will apply. Working on a watershed basis will ensure that impacts from upstream development do not affect lands in the lower part of the watershed (which may be in a different jurisdiction). Where watersheds cross community boundaries, "community scale" planning should include these adjacent areas.

### SELECT AN APPROPRIATE SCALE FOR ENVIRONMENTAL PLANNING

☑ When selecting a scale for planning, consider what scale will best address environmental considerations. This may be a community-wide or landscape scale, a watershed scale (that may involve more than one jurisdiction), or a smaller scale such as a sub-watershed, neighbourhood or local area plan.

### CONSIDER ALL ASPECTS OF THE ENVIRONMENT IN COMMUNITY PLANS

☑ Ensure that community plans address a range of environmental aspects, including:

- Identification, protection and potential for restoration of important wildlife habitats;
- Location of development away from environmentally sensitive areas;
- Prevention of fragmentation of environmentally sensitive areas or other important habitats;
- Minimization of crossings of watercourses and riparian areas;
- Maintenance, and potential for restoration, of wildlife corridors;
- Mimicking of natural stormwater drainage and infiltration processes;
- Energy conservation (e.g. through 'green' buildings, encouragement of walking, bicycling and transit use);
- Water conservation (e.g. through **xeriscaping** and water-efficient devices);
- Waste reduction and encouragement of recycling;
- Naturalisation of public spaces (e.g. treed boulevards, planting of native shrub and herb species);
- Retention of habitat values on adjacent resource lands (agricultural, forest and mining);
- Reduction of sprawl and retention of greenspaces; and
- Management of **invasive species**.

☑ Set targets for environmental protection and management. For example, "protect xx% (as needed to preserve viable habitats) of the land within the urban containment boundary in a relatively natural state" and "decrease volume of solid waste by yy% in the next five years."

☑ Ensure that the Official Community Plan is worded to permit and encourage the development of supporting environmental bylaws.

**"ECO-TARGETS"**

Urban design consultant Michael von Hausen gives these examples of targets for a "balanced ecological planning approach":

1. **Green space expansion and mixed uses:** 50-100% increase in green space and associated mixed uses (compensated by clustering of development elsewhere).
2. **Designed density:** A two- to four-fold increase in density.
3. **Site water management:** a) 0% runoff and maintain or improve water quality using 'green infrastructure' methods; and b) a 20-50% decrease in underground pipes for sewer and water.
4. **Road transformation:** A 50% decrease in roads and parking and a 50% increase in bicycle and walking paths; use of grass grid and painted lines on grass for traffic overflow.
5. **Waste efficiency:** 50% decrease in solid waste.
6. **Energy efficiency:** 30-60% decrease in energy use through building orientation (south facing to catch the sun), tree conservation (for windbreaks and shading) and efficient fixtures (such as compact fluorescent light bulbs).

*(von Hausen 2004, p. 16)*

Many Regional Districts have developed habitat atlases that combine environmental information from a variety of sources. For example, the Sunshine Coast Habitat Atlas combines data from over 40 sources, providing information that supports the protection, enhancement, and restoration of fish habitat and sensitive ecosystems. For more information see http://habitat.scrd.bc.ca/

#### IDENTIFY AREAS OF ENVIRONMENTAL VALUE IN COMMUNITY PLANS

☑ Ensure that the Official Community Plan includes maps of hazard lands, environmentally sensitive areas and other environmental values.

☑ Update the Official Community Plan as required to incorporate new inventory information.

☑ Identify 'green connections' within the community that link natural areas together and are of sufficient width to allow for wildlife movement.

☑ Develop park plans and greenways plans that protect ecological values in the long term.

☑ Designate environmentally sensitive areas and appropriate buffers as development permit areas (DPAs). DPAs should include guidelines limiting how or if development can occur. For examples of DPA language, see the Sensitive Ecosystems Inventory Conservation Manual for East Vancouver Island/Gulf Islands and the Technical Report for Central Okanagan.

For an example of an 'idealised' neighbourhood/local area plan, see Appendix 3-2.

### *3.4.2 Inventory and Mapping*

#### IDENTIFY KNOWN ENVIRONMENTALLY SENSITIVE AREAS AND SPECIES AT RISK

☑ Identify any existing mapping and inventory information (see Appendix B: Sources for Environmental Mapping and Inventory) such as the Sensitive Ecosystems Inventory, Sensitive Habitat Inventory and Mapping, Fish Wizard and environmentally sensitive area mapping. Ensure that data is gathered for all local ecosystem types, including terrestrial, aquatic and riparian ecosystems. Be aware that regional scale mapping may not identify small, but locally important, natural areas—these will need to be identified on the site or neighbourhood level plans. Not all maps and inventories are digitally available—seek out other documented information including unpublished sources.

☑ Identify known occurrences of species at risk, including federally-listed and provincially-ranked species. The Conservation Data Centre maintains information on 'element occurrences'—approximate known locations of species at risk.

☒ **Do not include information on specific locations of species at risk on community maps without consulting the Ministry's regional staff**, as this publicity could further endanger the species. This information may be provided to a potential developer and their consultants for the purpose of preparing a development plan that avoids occurrences of species at risk, or to local conservation organisations for the purposes of protecting the species (with the similar proviso that this information not be published).

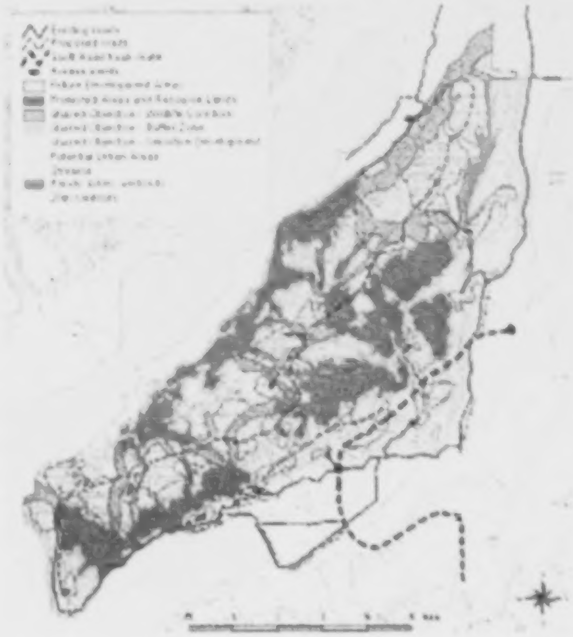
### Conduct additional inventories to identify other important wildlife and habitat values

☑ Identify other habitats that may not be 'environmentally sensitive' but are nonetheless important components of the wildlife habitat of the area. Examples include second growth forests, hedges on agricultural lands, scrublands and other modified ecosystems.

☑ Work in partnership with other governments, community groups and **appropriately qualified professionals** to conduct additional community-wide inventories of species and ecosystems to address any information gaps. The Resource Information Standards Committee provides information on standards for conducting ecosystem inventories. This data will add detail to the information from higher-level inventories such as a Sensitive Ecosystems Inventory. Natural history groups, land

The Community Mapping Network is building capacity within communities to compile local knowledge and to access natural resource information, and to promote planning sustainable communities in B.C. For information see www.shim.bc.ca.

The Ministry of Water, Land and Air Protection worked with the Allan Brooks Nature Centre to develop a "balanced growth" scenario for the Bella Vista-Goose Lake Range near Vernon. The project used the Sensitive Ecosystems Inventory and capability mapping for 10 species at risk to develop maps identifying conservation ratings and priorities. This was combined with planning information to define areas of sensitivity, wildlife corridors and the most suitable places for urban development (*Clarke et al 2004*).



trusts and other community interests may have survey information they can share, or may be able to work in partnership with the local government to carry out inventory work.

☑ Ensure that mapping and inventory information gathered by developers and their consultants is provided to the local government and added to their inventory database (see Section 4: Environmental Planning and Development at the Site Level) as well as the provincial database as appropriate.

#### Identify hazard lands

☑ Identify areas subject to flooding, erosion, wildfire and other natural hazards in community plans. For more information see Section 3.4.6 Flood and Terrain Hazard Management and Section 3.4.8: Wildfire Considerations.

Salt Spring Island is using density transfer to direct development away from sensitive ecosystems and into less environmentally sensitive areas.

The District of Hope has developed a cluster development zone and performance standards to protect environmentally sensitive areas in the District.

### 3.4.3 Appropriate Development

#### Locate development appropriately

☑ Using the information from the mapping and inventories, develop appropriate zoning and servicing to concentrate growth and development away from environmentally sensitive areas, resource lands (agricultural and forest lands) and hazard areas.

☑ Encourage densification of development in areas with low environmental values in exchange for the protection of areas with high environmental values, using tools such as density bonusing and density transfer.

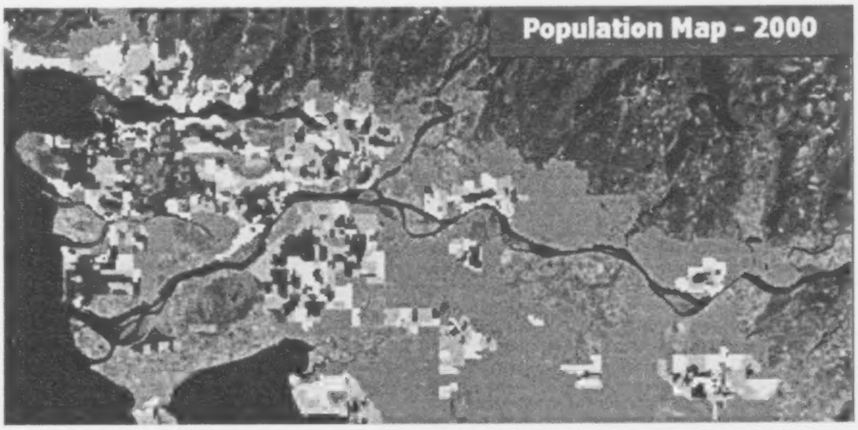
☑ Consider the impacts of different development types on adjacent ecosystems. A shopping mall with bright parking lot lights would be detrimental to an adjacent wetland, while a housing development with appropriate buffers may be far less damaging. (The many wetland creatures that use darkness to hide from predators and the plants that flower according to length of daylight would be disrupted by the bright lights.)

#### Avoid rural sprawl

'Rural sprawl' is the growth of low density developments into the areas surrounding our town and cities. People move out to be in the country, and are often unpleasantly surprised when other growth and development occurs, threatening the lifestyle they had come for. This sprawling growth also has huge impacts on wildlife, as large areas of habitat are alienated by clearing, buildings, road development and increasing human activity.

☑ Establish an urban containment boundary that limits sprawl and concentrates growth in appropriate areas.

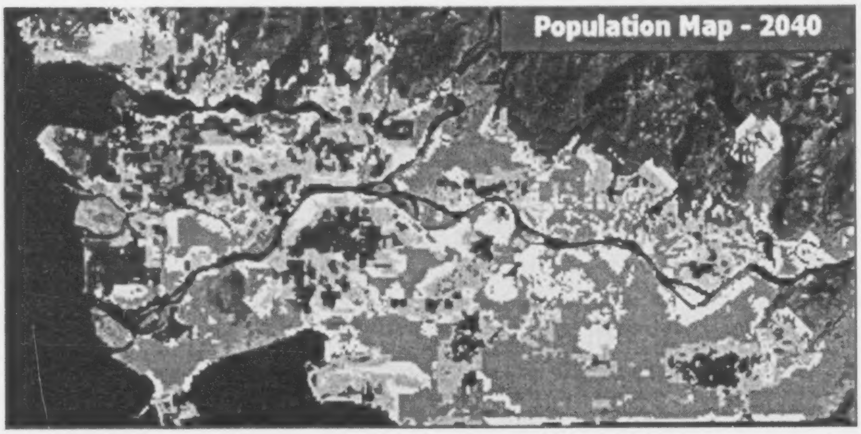
☒ Discourage 'satellite' developments outside of the urban containment boundary. These are more expensive to service, cause habitat fragmentation and displace many wildlife species that are not tolerant of human presence. They are also more prone to public safety risks from wildfire and from 'problem' wildlife.


Population Map - 2000

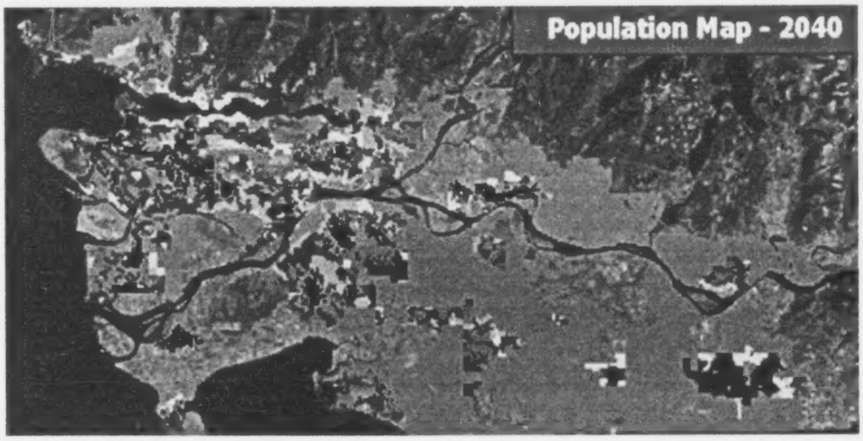
Lower Fraser Valley Population Density, 2000. Black and red areas indicate high density, green indicates open space (including agricultural lands).

There are two projected land use scenarios for 2040, based on a) urban expansion continuing in its present form or b) using a higher density urban form with infill development. Scenario (b) conserves considerably more open space. (*Source: Georgia Basin Action Plan 2004.*)

a


Population Map - 2040

b


Population Map - 2040

☒ Avoid large-lot subdivisions. Unless covenants are placed on the land to restrict the 'footprint' of the development, these large lots can destroy large amounts of wildlife habitat.

☑ Adopt 'smart growth' principles to reduce sprawl and minimise the impact of development on the environment. For more information see www.smartgrowth.bc.ca.

**TEN SMART GROWTH PRINCIPLES**

- Build compact communities that avoid sprawl.
- Create walkable communities.
- Promote development patterns that encourage the use of sustainable transportation.
- Foster distinct, attractive, vibrant communities with a strong sense of place
- Protect and preserve green space and environmentally sensitive areas in urban and suburban areas.
- Ensure the integrity of a secure and productive agricultural land base.
- Provide a range of affordable housing options.
- Promote energy efficient infrastructure and alternative development standards.
- Strengthen and direct development towards existing communities.
- Ensure an early and ongoing role for community engagement in the planning, design and development process.

*Smart Growth B.C.* www.smartgrowth.bc.ca

Preserve the best and restore the rest

### *3.4.4 Ecosystem and Species Protection*

Major threats to species and ecosystems include:

- Habitat destruction. As habitats are lost to development, road building and other human activities, the wildlife that once lived there will move away—if there is another suitable habitat nearby—or die out.
- Invasive species: These plants and animals take over the natural habitats of native species, competing for food, water, space and light. Some 'successful' invaders such as English ivy can completely replace native vegetation, radically altering the ecosystem.
- Habitat fragmentation. Some species do not tolerate human presence. Roads, trails and 'satellite" subdivisions introduce human presence into new areas, making it no longer suitable for these shyer species.
- **Islandisation:** In many urban and suburban areas the only remaining natural ecosystems are small remnants—islands that are cut off from each other. This limits the amount of genetic mixing that can occur, and leaves the species that live there vulnerable to external influences such as predation by pets.

The best management practices listed below are designed to avoid or minimise these impacts during land development. Other impacts such as human activities (e.g. hunting and fishing) and climate change will also affect wildlife populations, but are not discussed in this document.

The best way to protect ecosystems during development is to preserve the **best and restore the rest**.

## ECOLOGICAL NEEDS

Ecological principles that should guide urban and rural land development are:

- **Larger sites provide a greater variety of habitats.** A 40 ha site will tend to support a greater diversity of species and habitats than a 10 ha site. Some animals require a minimum size area in which to live. Also, smaller sites are more prone to the 'edge effect.' In a forest for example, some plants only live in the interior of the forest where there is less light, less wind and higher humidity. There is proportionately more interior space in a large forest than in a small patch of trees.
- **Diversity is better.** Greater ecosystem diversity tends to support greater species diversity. Maintaining a diversity of ecosystems ensures a variety of food sources and cover, and the availability of preferred breeding and rearing areas. Individual species may utilise several different types of habitat. Herons, for example, need tall trees for roosting, that are close to wetlands or shorelines where they can feed. Other species need different habitats at different stages of their life, such as a caterpillar that eats different plants from the adult butterfly. Also, when the diversity of species in an ecosystem is decreased, the ecosystem becomes less productive.
- **Closer is better.** There is a better chance of interbreeding (and thus greater genetic diversity) if two populations are closer together. If two habitats are close together, this increases the ability of species to move from one area to the next. Areas that are ecologically isolated having a greater chance of losing an entire population (local extirpation) because of disease or further habitat loss.
- **Linkages help.** There is a better chance of preventing fragmentation effects if individuals or whole populations can safely move from one area to the next with less chance of predation or interception. For many species, the chance of surviving catastrophic natural events (such as fire or flood) or impacts from human activities are much greater if their habitats are connected to similar neighbouring or adjacent without large breaks or barriers. In urban areas, riparian corridors, recreational greenways, street boulevards and backyards can provide these types of linkages.
- **Redundancy ensures sustainability.** If there is only one remaining population of a particular species, the chances of extirpation are very high. Having several populations in different locations increases overall survival. In economics, a diverse portfolio is more likely to survive long-term changes in the market. In urban biodiversity, growth pressures require us to think about the need to create population banks or reservoirs that act as backups for potential loss.
- **Small habitats can be critical to a species survival.** In the Greater Vancouver region the collective impact of many small habitats can be as great as a single Stanley Park. These fragmented habitats are critical areas for many urban species. Some of these small areas may contain remnant populations of rare or endangered species. Others may be important because they provide a link between larger habitats, or simply because they support local biodiversity by providing a home for one of the many species that have adapted to living in urban and suburban environments.
- **Buffers help to protect core areas.** Because of the 'edge effect,' the impacts of human activity and other ecosystem stressors such as invasive species tend to be greatest at the edges of ecosystems. A buffer area helps to protect core areas from these impacts. For example, a forest buffer between a mall parking lot and a wetland can filter some of the pollutants from stormwater, reduce the number of shopping carts that are thrown in, shade the edges of the wetland, and reduce the noise and visual impact of the parking lot." (*Cullington 2001*)

Identify and protect habitat reservoirs.
PHOTO: SUSAN LATIMER

### RETAIN LARGE HABITAT RESERVOIRS

**Habitat reservoirs** are large areas that support a range of native plant and animal species, and several ecosystem types.

☑ Use the mapping and inventory information to identify habitat reservoirs in your community, such as wetlands. Habitat reservoirs should be as large as possible (recognising that in general their size will be larger in rural areas than in urban areas). An appropriately qualified professional or staff from the Ministry of Water, Land and Air Protection may be able to help you identify habitat reservoirs in your community, and refer you to related documents such as Recovery Plans for species at risk.

☑ Delineate these habitat reservoirs in community plans, including effective buffer areas, and establish zoning that will preclude development of these areas. Where it is not possible to preclude development, development permit areas or other tools should be established to require sensitive development that protects natural values. An appropriately qualified professional can assist in defining measures that can protect the natural values.

☑ Establish some form of legal protection for the habitat reservoirs, such as designation as a natural park. Work with local land trust organisations to encourage **conservation covenants** on private lands/waters with high environmental values, or purchase of some of these lands.

☑ Work with an appropriately qualified professional to develop management plans for these areas that address long-term protection of ecological values. This may include managing impacts from recreation, edge effects, invasion by non-native species and fire control.

The Greater Vancouver Regional District is developing a Biodiversity Conservation Strategy for the region. This involves identification of habitat reservoirs and refuges, and working with member municipalities and conservation interests for the conservation of biodiversity in this urbanised region. For more information see http://www.gvrd.bc.ca/growth/pdfs/biodiversity.pdf

**DIVERSE ECOSYSTEMS FOR DIVERSE SPECIES**

To protect a diversity of species, we need to protect a diversity of ecosystem types. Plan to protect a full range of different ecosystem types in the community plan (specific ecosystem types will depend on those native to your area). For example:

- Forests and woodlands
- Grasslands, including old field habitat and natural meadows
- Wetlands (vernal pools, marshes, swamps, bog, etc.) and estuaries
- Riparian areas around watercourses, lakes and coastal foreshore
- Open rocky areas and moss-covered rocks
- Cliffs and bluffs (inland and coastal)
- Sparsely vegetated areas, including gravel bars and sand dunes

### RETAIN HABITAT REFUGES

**Habitat refuges** are smaller patches of habitat. They may include small remnants of natural ecosystems and human-modified areas such as agricultural lands, playing fields, and even naturalised backyards. They provide important habitats for species that are more tolerant of people, such as hummingbirds.

☑ Identify habitat refuges in your community, and work with the community to protect and enhance their habitat values.

- ☑ Retain different ecosystem types adjacent to each other, such as forested patches next to old fields, pastures or fallow fields. These enhance the habitats accessible to wildlife, as many species prefer having different habitat types close together (referred to as '**edge habitat**').
- ☑ Establish passive use parks with natural areas of forests and/or grasslands next to maintained playing fields. Limit impacts in these areas, for example through well-designed trails and requirements to keep dogs on a leash.

### IDENTIFY AND SET ASIDE WILDLIFE CORRIDORS

The ecological values of habitat reservoirs and refuges increase if these areas are connected together by wildlife corridors. Wildlife corridors provide for the movement of species between larger areas of habitat, and also provide year-round habitat for less mobile species such as plants, invertebrates and small mammals.

- ☑ Identify wildlife corridors—including corridors for large species such as deer, and smaller species such as frogs—and use development permit area or zoning designations to restrict development in these corridors.
- ☑ Develop a community **greenways** plan to identify habitat reservoirs, refuges, and wildlife corridors connecting them. For more information see *Community Greenways: Linking Communities to Country, and People to Nature*.

Plants and animals need food, water and shelter to survive. Just as humans need roads and sidewalks to get between home and their shops, animals need a safe route between their nest and dens and foraging areas. Wildlife corridors provide that safe passage.

### SET BUFFERS AROUND SENSITIVE AREAS

**Buffers** help to maintain the long term values—both environmental and economic—of an environmentally sensitive area. Target buffer widths are provided in Section 4, Table 4-1.

- ☑ Establish buffers around all environmentally sensitive areas. Buffers should not only preclude development, but should also promote the retention of natural vegetation as part of the buffer. Buffers for terrestrial environmentally sensitive areas are described in Section 5: Environmentally Sensitive Areas. Buffers around habitats for special wildlife are described in Section 6: Special Wildlife and Species at Risk, and riparian buffers are described in Section 7: Aquatic and Riparian Ecosystems.
- ☑ In new developments, buffers should be of sufficient width to discourage access by humans and their pets to the environmentally sensitive area, reduce invasion by non-native species and protect interior habitats from degradation. The width of the buffer will depend on its purpose and the sensitivity of the habitat you are trying to protect.
- ☑ In brownfield developments and re-developments, buffers should be as wide as possible, and restoration of natural vegetation should be encouraged.
- ☑ Where possible, buffer areas should be on public lands. Another option is to place conservation covenants on the buffer areas that are on private land, but these covenants must be enforced to prevent intrusion into the buffer area. Other options include easements and stewardship agreements. For more information see Stewardship Options for Private Landowners in British Columbia, and *Greening Your Title: A Guide to Best Practices for Conservation Covenants*.

The Islands Trust has created a Natural Areas Protection Tax Exemption, and can issue 'Tax Exemption Certificates' to property owners who voluntarily give permanent legal protection to specific types of natural areas on their property. For more information see http://www.islandstrust.bc.ca/stewardshipprograms/naturalareaprotection/naturalareaprotection.htm

### CREATE INCENTIVES FOR NATURAL HABITAT PROTECTION

Consider offering incentives for natural habitat protection:

☑ Encourage the protection of riparian areas through eligible tax exemptions under the Community Charter (Section 225).

☑ Use the federal Eco-gifting program to encourage donations of environmentally sensitive lands/waters. For more information see the Eco-gifting website or *Green Legacies: A Donor's Guide for B.C.*

☑ Offer tax breaks for the gifting of conservation covenants or other natural area protection mechanisms.

☑ Provide recognition for individuals within the community that are undertaking voluntary conservation and stewardship of public or private lands.

### ENACT BYLAWS TO CONTROL PETS

☑ Require that dogs be leashed in sensitive habitats (such as beach areas) to prevent them from chasing birds or other wildlife.

☑ Encourage pet owners to keep cats indoors. Domestic pets, especially cats, can be significant predators on wildlife.

☑ In urban areas, enact bylaws requiring cats to wear bells to reduce their success at hunting.

## *3.4.5 Ecosystem and Species Restoration and Enhancement*

Some communities have a great deal of damaged habitat with potential for restoration. The following best management practices provide guidance on restoration efforts.

### DEVELOP RESTORATION PLANS

☑ Work with conservation organisations and appropriately qualified professionals to develop landscape-level restoration plans for habitats that have been degraded. The plans should consider the impacts of future developments that may support or limit the success of site-level restoration efforts, and set priorities accordingly.

☑ Work with an appropriately qualified professional to develop a site restoration plan for the specific site(s) being restored. This will include determining the appropriate state to restore the ecosystem to—for example, in a rural area the goal may be to re-create the natural ecosystem, whereas in a highly urbanised area the goal may be less ambitious.

☑ Support community efforts to restore ecosystems (e.g. programs such as Streamkeepers, Wetlandkeepers and the Grasslands Conservation Council projects).

### TAKE ADVANTAGE OF RESTORATION OPPORTUNITIES OFFERED BY RE-DEVELOPMENT

☑ When a degraded site is being re-developed, work with the landowner to rehabilitate some of the natural values of the area. This can include simple techniques such as naturescaping the property, or more far-reaching projects such as daylighting streams, increasing the amount of pervious surfaces and restoring natural ecosystems on part of the property.

The City of Vancouver has long term plans to daylight and restore parts of Still Creek as part of the Grandview-Boundary Industrial Area re-development.

### MANAGE INVASIVE SPECIES

☑ Identify problem areas with invasive and **alien** species and work with maintenance staff, weed specialists and community volunteers on invasive species removal. For information on management of alien species, see the Aliens website.

☑ Learn more about invasive species in British Columbia. An Invasive Plant Council of British Columbia is being established to minimise the effect of invasive plants on human health, the economy and the environment. For more information, see the *Invasive Plant Strategy for British Columbia.*

**INVASIVE SPECIES ENDANGER PUBLIC HEALTH AND SAFETY**

Invasive species:

- Increase allergies and hay fever, and are potentially toxic to humans, pets, livestock and wildlife.
- Clog waterways used for swimming and boating, and reduce visibility on transportation corridors.
- Increase costs for maintaining resources and public utilities.
- Displace native species and destroy natural habitat for birds, butterflies and other wildlife, domestic animals, and fish and other aquatic organisms." *Fraser Basin Council 2004.* http://www.fraserbasin.bc.ca/news/documents/invasive_plant_strategy04.pdf

Assess flood risk.
PHOTO: MARGARET HENIGMAN

### *3.4.6 Flood and Terrain Hazard Management*

Flood and terrain hazard management is important for the safety of residents and their property.

### ASSESS AND MITIGATE FLOOD RISK

☑ Identify areas subject to flooding. For information on floodplain mapping, see the Canada - British Columbia Floodplain Mapping Program.

☑ Assess flooding and erosion risk effects to aquatic habitat and to downstream water users from stormwater runoff. Proposed developments that would increase existing levels of risk (or create new high-risk effects) to aquatic habitat, downstream water users, or downstream floodplains should either not be permitted to proceed or should be required mitigate those impacts.

☑ In areas subject to tsunami effects, consider the potential hazard of a tsunami wave when determining flood damage reduction measures. Elevations may be established using recorded events in the area plus a suitable allowance for freeboard.

☑ **Restrictive covenants** must be placed on areas subject to flooding hazard, pursuant to Section 82 of the *Land Title Act*, and Section 3(3) of the Bare Land Strata Regulations, in order to minimise claims on public funds, minimise damage to property and to warn future property owners of a flooding hazard. These covenants contain flood-proofing conditions and a waiver of liability to the province and local authority, and are registered under Section 219 of the *Land Title Act* on the title of land subject to flooding at the time of subdivision or on the sale or grant of Crown land. Similar conditions and waivers must be included in leases or other dispositions of Crown land under Part 2 of the *Land Act* on land subject to flooding.

☑ Enact floodplain management bylaws to control development within lands subject to flooding.

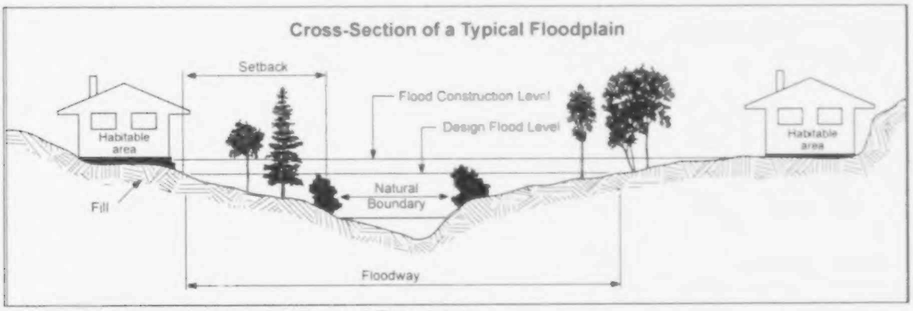


Figure 1: Cross-section of a Typical Floodplain

IDENTIFY AND ASSESS TERRAIN HAZARDS

☑ Consult available regional terrain inventory mapping to determine the terrain suitability for various purposes. Do not permit development in unsuitable areas.

☑ Ensure sites that may possess geotechnical hazards (unstable slopes, poor foundation conditions, debris flow hazards, earthquake prone soils, high water tables, etc.) are assessed by an appropriately qualified professional before development proceeds.

☑ Identify and avoid areas where avalanches may occur. Consider the impacts of upslope activities that might result in increased avalanche risk (e.g. land clearing).

See Section 4: Environmental Planning and Development at the Site Level for site-specific considerations for flood and terrain hazard management.

### 3.4.7 Erosion and Sediment Control

Community level practices can influence the ability to control erosion and sediment generation at the site level (see Section 4: Environmental Planning and Development at the Site Level). The following best management practices address erosion and sediment control at the community level.

CONTROL EROSION AND SEDIMENT

☑ Identify areas of high risk of sediment movement within the watershed. Erosion and sediment control should be considered on a watershed-wide basis to ensure that development in one part of the watershed does not impact instream features downstream.

☑ Develop policies on how site development should be carried out in high risk areas to minimise sediment generation.

☑ Establish timing restrictions that prevent clearing of sites at times when work or the conditions of the soils could result in substantial erosion and sediment generation (e.g. during high rainfall periods or snowmelt).

### 3.4.8 Wildfire Considerations

B.C.'s forests and grasslands burn from time to time. The extensive damage to homes in the Kelowna and Kamloops areas during the summer of 2003 demonstrated the need to carefully consider where to build new communities.

Wildfire is a natural process, and many natural ecosystems in British Columbia thrive on occasional or even frequent burns. Failure to plan for wildfire may leave a local government vulnerable to liability claims for damage. For more information on building "FireSmart" communities, see *FireSmart: Protecting Your Community from Wildfire*, developed in Alberta.

ADDRESS THE POSSIBILITIES OF WILDFIRE BEFORE PERMITTING 'SATELLITE' DEVELOPMENTS

☑ Consider wildfire possibilities in the Official Community Plan.

☑ Densify existing communities rather than building new subdivisions in areas prone to wildfires. Avoid 'satellite' subdivisions.

☑ Develop a fire plan prior to permitting development. This will include considerations such as water supply, road access and fire breaks.

☑ Identify high risk wildfire areas before approving new subdivisions. Locating development in areas subject to wildfire can affect forest management strategies, as when fire occurs, the emphasis shifts from protecting forests to protecting homes. Also, some homeowners may not accept fire-proofing techniques (such as controlled burns) in their neighbourhood, because of safety concerns and loss of viewscapes.

The District of Langford required sprinkler systems to be installed in one subdivision close to a forested area. This was done as an alternative to clearing the trees away from the subdivision, as originally requested by the fire department.

DEVELOP A PLAN TO BALANCE FIRE MANAGEMENT AND WILDLIFE CONSIDERATIONS

☑ Work with local fire and emergency experts to "fire-proof" existing developments. The fire-proofing should be completed with wildlife in mind, so that important ecological features (such as brush buffers) are not destroyed by the fire-proofing techniques.

### 3.4.9 Wildlife-Human Conflicts

When we build communities, we do so in places that are the homes of many different species of plants and animals. Native plants and trees are replaced by roads, building and lawns, and many of the native animals die out or move elsewhere. Some of the more adaptable species remain or move into the area, to benefit from the human activities and become pests. 'Garbage bears' and other wildlife can become a problem.

Rattlesnake.
PHOTO: DAVE POLSTER

Rattlesnakes hibernate in communal dens and may travel long distances from their dens to summer sites. Den locations and travel paths should be avoided when planning developments. See *Best Management Practices for Amphibians and Reptiles.*

There are many ways to reduce impervious surfaces that can be used in small- or large-scale developments, such as reducing road width and using roadside swales rather than a piped system. See *Stormwater Planning: A Guidebook for British Columbia.*

CONSIDER WILDLIFE-HUMAN CONFLICTS WHEN PLANNING NEW DEVELOPMENTS

☑ Avoid development in or adjacent to habitat reservoirs and refuges, wildlife corridors and their buffer areas. Consider the needs of large mammals (bears, moose, deer, cougars) as well as smaller species (amphibians, snakes, birds).

☑ Be aware of potential wildlife conflicts for airport and solid waste management facilities. For more information on airport siting see the Transport Canada publication *Sharing the Skies.*

☑ Refer to the *Beaver Management Guidelines* and the Beaver and Beaver Dam Management sections of the Best Management Practices for Instream Works when dealing with beaver issues.

☑ Refer to the *Best Management Practices for Amphibians and Reptiles* and *Best Management Practices Guidebook for Raptors in British Columbia: Guidelines for Integrating Raptor Conservation with Urban and Rural Land Developments* when dealing with these species.

### 3.4.10 Pollution Prevention

For best management practices on pollution prevention see Section 8: Pollution Prevention.

### 3.4.11 Stormwater Management

Best management practices for urban stormwater management are provided in *Stormwater Planning: A Guidebook for British Columbia*. Stormwater management techniques are designed to put water back into the ground, preserve or improve the water quality and hold back the water through rate control/detention.

The federal and provincial governments and other partners have developed a Water Balance Model that can be used to assess stormwater volumes due to urban development, and the types of source controls that can be used to reduce the volume of overland runoff. This model also allows users to evaluate the effectiveness of various types of source control. For more information see the Water Balance Model for British Columbia website.

ESTABLISH BYLAWS TO ENCOURAGE GOOD STORMWATER MANAGEMENT

☑ Enact bylaws or establish development permit areas that require the maintenance of stormwater characteristics that emulate the pre-development natural watershed, including that stormwater volumes reaching lowlands are the same after development as they were before. This will discourage large scale clearing and creation of **impervious surfaces,** reduce servicing costs (storm sewers), and help to recharge aquifers and maintain stream flows during low flow periods. For more information see *Stormwater Planning: A Guidebook for British Columbia*.

☑ Review existing bylaws, policies, designs and standards (such as road and curb and gutter standards) for opportunities to improve stormwater management (retention/detention/imperviousness) in future developments and re-developments.

### *3.4.12 Lead by Example*

Local governments have the ability to demonstrate good environmental practices in action. For example:

#### NATURESCAPING

☑ Use native plantings and '**naturescape**' principles on public lands to demonstrate to residents the benefits of native plantings for maintenance and as wildlife habitat. These benefits include lower watering needs and reduced maintenance costs, if appropriate native species are selected.

☑ Consider planting more trees in boulevards, municipal properties and parks. The urban forest provides benefits for people and wildlife.

#### STORMWATER MANAGEMENT

☑ Create zero-discharge stormwater systems for municipal facilities.

☑ Provide pervious paving in municipal parking areas.

☑ Use porous paving in crosswalks, parking stalls and other such sites to drain road surfaces.

☑ Reduce overland runoff through the use of infiltration basins, green roofs and absorbent vegetation.

#### GREEN TRANSPORTATION OPTIONS

☑ Encourage the use of bicycles and walking by providing employee showers and change facilities.

☑ Provide safe bicycle storage areas for employees and visitors.

#### GREEN BUILDINGS AND FACILITIES

☑ Construct buildings to conform with **LEED™** (Leadership in Energy and Environmental Design) standards for 'green' buildings. For information on funding and standards for the building and retrofit of green buildings, see the Green Buildings BC program. For information on LEED™, see the LEED (Leadership in Energy and Environmental Design) Green Building Rating System™.

☑ Improve the energy efficiency of municipal buildings and facilities like swimming pools, water systems, and sewage treatment plants.

☑ Install low-flush toilets and other water-saving devices.

☑ Use xeriscape landscaping to reduce water use.

WASTE MANAGEMENT

☑ Capture methane gas from landfills. Methane has 21 times the heat-trapping effect of $CO_2$. This gas can also be used for heating or producing electricity.

☑ Promote the reduction of all forms of waste, and re-use or recycle as much as possible.

## 3.5 LOCAL GOVERNMENT RESPONSIBILITY FOR ENVIRONMENTAL PLANNING AT THE SITE LEVEL

Local governments have the final say in land use and development patterns, and are one of the primary contacts with the development community. They have a responsibility to ensure that development benefits the community—socially, economically and environmentally.

Responsible environmental planning at the site level benefits the development community as well as the local government and residents. For example:

- Developments that incorporate greenspace and retain trees are generally more desirable for prospective buyers. This leads to higher property prices and faster sales.
- Developments that are supported by the community—and those that promote environmental values frequently are—move faster through the planning and approval process, with time and cost savings for the developer.
- Where developments are densified to protect greenspace, the footprint of the development is reduced. This may mean cost savings for land clearing, road development and servicing costs.

For more information, see Appendix A: Benefits of Environmental Protection.

### GOVERNMENTS LEAD BY EXAMPLE

- The Capital Regional District has recently constructed a new office building that meets the LEED™ silver standard, and is constructing a second building that will meet the gold standard.
- The Greater Vancouver Regional District is developing a regional Biodiversity Conservation Strategy that will identify habitat reservoirs and refuges, as well as important greenspace connections between these areas.
- The Regional District of Comox Strathcona have designated Bald Eagle and Great Blue Heron development permit areas that restrict land clearing and prevent other activities during nesting periods.
- The City of Vancouver RS-1 residential zone limits the amount of impermeable surface in property development/redevelopment to reduce stormwater runoff, increase groundwater recharge and reduce flooding.
- The Maplewood Community Eco-industrial Project is a partnership between the District of North Vancouver and 30 other partners that combine sustainable community planning and eco-industrial networking (http://www.maplewoodproject.org).

**Is your local government doing something worth bragging about? Fill out the feedback form in Appendix 1-1 and let us know.**

### *3.5.1 Working with Landowners and Developers*

☑ Be open to novel approaches to environmental problems as some new technologies can provide significant benefits at minimal or reduced cost. Ensure that bylaws and regulations allow for innovative approaches.

CREATE A REGULATORY FRAMEWORK THAT PROMOTES ENVIRONMENTAL PROTECTION AND STEWARDSHIP

☑ Enact bylaws that promote environmental protection and stewardship, such as soil protection bylaws. For a list of possible bylaws, see *Stewardship Bylaws: A Guide for Local Government*.

☑ Establish Development Permit Areas for sensitive sites, and ensure that the guidelines for development address ways to protect ecosystem values, for example by restricting timing of construction so that it does not compromise nesting or spawning (check timeframes with an appropriately qualified professional).

PROVIDE INCENTIVES FOR ENVIRONMENTAL PROTECTION AND STEWARDSHIP

☑ Make landowners and developers aware of the benefits of incentive programs such as Eco-gifting or tax breaks for natural area protection (see Section 3.4.4: Ecosystem and Species Protection).

☑ Consider incentives for good developments, such as awards for 'green' developments or fast-tracking of approvals that provide large amounts of Greenspace and protect environmentally sensitive areas.

Chickadee.
PHOTO: MARLENE CASKEY

PROMOTE THE USE OF NATIVE SPECIES IN LANDSCAPING

☑ Use native tree species for boulevard plantings, and native shrubs and herbs for landscaping work. Native species are adapted to the local climate, and require less maintenance and watering than many imported species.

☑ Restore natural tree cover that will promote shading and discourage the growth of some invasive plant species, such as Himalayan blackberries in riparian areas.

DRAW ON LOCAL KNOWLEDGE AND EXPERTISE IN THE DESIGN OF DEVELOPMENTS

☑ Encourage local naturalist clubs, stewardship groups and similar organisations to provide input into development decisions. These groups often have knowledge of local flora and fauna as well as movement corridors and important habitats that can contribute to environmentally effective design of developments. Property values are enhanced by a sensitive treatment of local natural values.

EDUCATE LANDOWNERS AND DEVELOPERS ABOUT THE BENEFITS OF ENVIRONMENTAL PROTECTION

☑ Provide information on the benefits of environmental protection (see Appendix A).

## 3.6 USEFUL SOURCES

*For complete references and a more extensive reading list, see the Bibliography.*

### LEGISLATION:

For a full listing of **provincial government legislation**, see http://www.qp.gov.bc.ca/statreg/list_statreg_l.htm

B.C. Community Charter (Bill 14) http://www.legis.gov.bc.ca/37th4th/3rd_read/gov14-3-toc.htm

B.C. *Land Act*: http://www.qp.gov.bc.ca/statreg/stat/L/96245_01.htm

B.C. *Land Title Act*: http://www.qp.gov.bc.ca/statreg/stat/L/96250_00.htm

B.C. *Local Government Act*: http://www.qp.gov.bc.ca/statreg/stat/L/96323_00.htm

B.C. *Strata Property Act*, Bare Land Strata Regulations: http://www.qp.gov.bc.ca/statreg/reg/S/StrataProperty/75_78.htm

For a full listing of **federal government legislation**, see: http://laws.justice.gc.ca/en/

### OTHER BEST MANAGEMENT PRACTICES DOCUMENTS:

These Best Management Practices documents will be posted on the Ministry of Water, Land and Air Protection website (http://wlapwww.gov.bc.ca/wld/BMP/bmpintro.html) in the near future. Some drafts are available for review on other websites. To obtain a copy for review or to comment on these drafts, contact Marlene Caskey (Marlene.Caskey@gems7.gov.bc.ca) or Dr. Grant Bracher (Grant.Bracher@gems2.gov.bc.ca) unless otherwise noted.

*Best Management Practices for Recreational Activities on Grasslands*

*Best Management Practices for Amphibians and Reptiles in Urban and Rural Environments in British Columbia*: http://www3.telus.net/public/leahmalk/BMP.pdf

*Standards and Best Practices for Instream Works:* http://wlapwww.gov.bc.ca/sry/iswstdsbpsmarch2004.pdf

*Best Management Practices Guidebook for Raptors in British Columbia: Guidelines for Integrating Raptor Conservation with Urban and Rural Land Developments*

To contact regional Ministry of Water, Land and Air Protection offices see http://wlapwww.gov.bc.ca/main/prgs/regions.htm

### STEWARDSHIP PUBLICATIONS:

All of the publications in the Stewardship Series are available at http://www.stewardshipcentre.bc.ca/sc_bc/stew_series/bc_stewseries.asp. These include:

*Coastal Shore Stewardship: A Guide for Planners, Builders and Developers*
*Community Greenways: Linking Communities to Country, and People to Nature*
*Green Legacies: A Donor's Guide for B.C.*
*Naturescape: British Columbia: Caring for Wildlife Habitat at Home*
*Stewardship Bylaws: A Guide for Local Government.*
*Stewardship Options for Private Land Owners in British Columbia*
*Stream Stewardship: A Guide for Planners and Developers*

## COMMUNITY DESIGN AND APPROPRIATE DEVELOPMENT

Brody, S., V. Carrasco and W. Highfield. 2003. "Evaluating Ecosystem Management Capabilities at the Local Level in Florida: Identifying Policy Gaps Using Geographic Information Systems." In *Environmental Management*, Vol. 32, No. 6, pp 661-681.

Clarke, D., L.Knuever, K. Iverson, M. Sarell and A. Hamer. 2004. "Balanced Growth for the Bella Vista–Goose Lake Range: A Demonstration of Landscape Planning for Ecosystems and Urban Growth in the North Okanagan." Paper prepared for the Allan Brooks Nature Centre, March 2004.

Curran, D. and M. Leung. 2000. *Smart Growth: A Primer.* Smart Growth British Columbia and University of Victoria Eco-Research Chair of Environmental Law and Policy, Victoria B.C.

Nolan, L., C. Rolfe and K. Grant. 2001. *The Smart Growth Guide to Local Government Law and Advocacy.* For this and other Smart Growth B.C. publications, see http://www.smartgrowth.bc.ca

von Hausen, Michael. 2004. *Eco-Plan: Community Ecological Planning and Design.* MVH Urban Planning & Design Inc., Surrey, B.C. http://www.mvhinc.com

## INVENTORY INFORMATION:

Conservation Data Centre: http://srmwww.gov.bc.ca/cdc/

Conservation Data Centre rare element occurrences: http://srmwww.gov.bc.ca/cdc/products.htm

Fish Wizard: http://www.fishwizard.com/

Sensitive Ecosystems Inventories (http://srmwww.gov.bc.ca/sei/index.html) are currently available for East Vancouver Island and Gulf Islands; Sunshine Coast; Bowen and Gambier Islands; Central Okanagan; and Bella Vista–Goose Lake Range (North Okanagan).

Sensitive Habitat Inventory and Mapping (part of the Community Mapping Network): http://www.shim.bc.ca/maps2.html

Resource Information Standards Committee http://srmwww.gov.bc.ca/risc/standards.htm

Terrain Inventory Mapping: http://srmwww.gov.bc.ca/terrain/inventory/index.html

For other area-specific inventories see Appendix B: Sources for environmental mapping and inventory.

## ECOSYSTEM AND SPECIES PROTECTION:

Cullington, J. 2001. "Goals and Objectives for the Protection and Restoration of Biodiversity: The Biodiversity Conservation Framework for the Greater Vancouver Regional District: A Discussion Paper."

Land Trust Organisations: For a listing of land trust organisations in British Columbia, contact the Land Trust Alliance of B.C., http://www.landtrustalliance.bc.ca/

Species and Ecosystems at Risk website: http://wlapwww.gov.bc.ca/wld/serisk.htm

Sensitive Ecosystems Inventory (East Vancouver Island and Gulf Islands) Conservation Manual. http://srmwww.gov.bc.ca/sei/van_gulf/doc/SEICMfinal.pdf

Sensitive Ecosystems Inventory (Central Okanagan) Technical Report: ftp://ftp.env.gov.bc.ca/dist/wis/tem/warehouse/region_3/central_okanagan/reports/cok_rpt.pdf

### INCENTIVES AND BENEFITS:

Eco-gifting: http://www.cws-scf.ec.gc.ca/ecogifts/intro_e.cfm

*Green Legacies: A Donor's Guide for B.C.*:
http://www.stewardshipcentre.bc.ca/sc_bc/stew_series/bc_stewseries.asp

Hillyer, A. and J. Atkins. 2000. *Greening Your Title: A Guide to Best Practices for Conservation Covenants.* This and other publications by West Coast Environmental Law can be found at http://www.wcel.org/resources/publications/default.cfm

Quayle, M. and S. Hamilton. 1999. *Corridors of Green and Gold: Impacts of Riparian Suburban Greenways on Property Values.* Fisheries and Oceans Canada, Fraser River Action Plan, Vancouver, B.C.

Habitat Acquisition Trust. 2004. *The HAT Manual: Protecting Natural Areas in the Capital Region.* Habitat Acquisition Trust, Victoria, B.C. http://www.hat.bc.ca

Sandborn, Calvin. 1996. *Green Space and Growth: Conserving Natural Areas in B.C. Communities.* B.C. Commission on Resources and Environment, Victoria, B.C.

### RESTORATION AND ENHANCEMENT:

Fraser Basin Council. 2004. Invasive Plant Strategy for British Columbia. Fraser Basin Council, http://www.fraserbasin.bc.ca

Alien species in British Columbia: http://wlapwww.gov.bc.ca/wld/aliensp/index.html

Pacific Streamkeepers Federation: http://www.pskf.ca/

Wetlandkeepers: http://www.naturalists.bc.ca/fbcn_bn/bn9910-7.htm

Grasslands Conservation Council: http://www.bcgrasslands.org/

Naturescape British Columbia: http://wlapwww.gov.bc.ca/hctf/naturescape/about.htm

Evergreen Canada has a variety of publications on green space and naturalising urban areas on its Common Ground website: http://www.evergreen.ca/en/cg/cg-toolshed.html

### FLOOD AND TERRAIN HAZARD MANAGEMENT:

Floodplain Mapping Program: http://srmwww.gov.bc.ca/aib/fpm/

Central Kootenay Regional District Floodplains, Alluvial Fans and Geotechnical Hazards: http://www.rdck.bc.ca/build/Floodplain.pdf

### WILDFIRE:

*FireSmart: Protecting Your Community from Wildfire:* http://www.partnersinprotection.ab.ca/downloads/

### PROBLEM WILDLIFE:

*Transport Canada. Sharing the Skies: An Aviation Industry Guide to the Management of Wildlife Hazards.* 2001. http://www.tc.gc.ca/CivilAviation/Aerodrome/WildlifeControl/tp13549/menu.htm

Ministry of Water, Land and Air Protection. *Beaver Management Guidelines.* http://wlapwww.gov.bc.ca/vir/pa/Beaver-Guide.pdf

Ministry of Water, Land and Air Protection. *Best Management Practices for Instream Works.* Specific Standards and Best Practices: Beaver and Beaver Dam Management: http://wlapwww.gov.bc.ca/wld/BMP/beaver.html

**STORMWATER MANAGEMENT:**

*Stormwater Planning: A Guidebook for British Columbia* (http://wlapwww.gov.bc.ca/epd/epdpa/mpp/stormwater/stormwater.html).

Water Balance Model for British Columbia: http://www.waterbalance.ca/sql/home/index.asp

**GREEN BUILDINGS:**

Green Buildings B.C. program: http://www.greenbuildingsbc.com/

LEED (Leadership in Energy and Environmental Design) Green Building Rating System™: http://www.usgbc.org/LEED/LEED_main.asp

## APPENDIX 3-1: DEFINITIONS

See also Glossary

Alien species: Plants, animals and micro-organisms from one part of the world that are transported beyond their natural range and become established in a new area. They are sometimes also called "exotic," "introduced," "non-native," or "non-indigenous" species. Some alien species are also **invasive species.**

Appropriately qualified professional: A scientist or technologist specialising in a relevant applied science or technology including, but not necessarily limited to, agrology, forestry, biology, engineering, geomorphology, geology, hydrology, hydrogeology or landscape architecture, and who is registered in British Columbia with their appropriate professional organisation, and acting under that association's Code of Ethics and subject to disciplinary action by that association, and who, through demonstrated suitable education, experience, accreditation and knowledge relevant to the particular matter, may be reasonably relied on to provide advice within their area of expertise.

Buffer: An area of land that surrounds and protects a sensitive feature from the adverse effects of activities on, or encroachments from, adjacent land.

Conservation covenant: A voluntary, written legal agreement in which a landowner promises to protect their land in specified ways. The covenant is attached to the title of land and binds future landowners to the terms of the covenant. The presence of the covenant may lower taxes by changing the assessed value of the land.

Ecosystem: The dynamic and interrelated complex of plant and animal communities and their non-living environment. All parts of an ecosystem, including physical, chemical and biological components are interconnected: that is, they affect and are affected by all other parts.

Edge habitat: The point at which dissimilar plant communities (different vegetation types, successional stages or vegetative conditions) meet. Many species have adapted to the interface between the two habitats.

Environmentally sensitive area: A term often used loosely to mean a site or area that has environmental attributes worthy of retention or special care. A more exacting definition is: any parcel of land that already has, or with remedial action could achieve, desirable environmental attributes. These attributes contribute to the retention and/or creation of wildlife habitat, soil stability, water retention or recharge, vegetative cover and similar vital ecological functions. Environmentally sensitive areas range in size from small patches to extensive landscape features. They can include rare or common habitats, plants and animals. Areas requiring special management attention to protect fish and wildlife resources, other natural systems or processes, and/or historical, cultural or scenic values. Environmentally sensitive areas also include hazard lands.

Erosion: A natural process of sediment movement as a consequence of water currents, rainfall runoff, or wind, which may be considered beneficial or detrimental, depending upon the associated environmental concerns.

Fragmentation: A process whereby large contiguous ecosystems are transformed into one or more smaller patches surrounded by disturbed areas.

Greenways: Networks of linked greenspace that provide wildlife habitat and recreational opportunities. They include trails in some areas and no public access in others. Greenways are created as part of an integrated approach to land planning, balancing the needs of human communities and natural systems.

Habitat: The natural home of a plant or animal within an ecosystem, which provides food and shelter and other elements critical to an organism's health and survival.

Habitat refuge: A small patch of habitat that provides food, shelter and/or other needs for wildlife. It may include human-modified ecosystems. They are not generally large enough to maintain the genetic diversity of a population.

Habitat reservoir: A large area of relatively natural habitat that has sufficient size and ecological integrity to support a range of native species, including species that need interior habitats and those that are less tolerant of human presence. The size of the habitat reservoir depends on the species being managed for. Habitat reservoirs are often hotspots of biodiversity in or near disturbed urban and rural landscapes.

Impervious surfaces: Surfaces that prevent water from going into the ground, such as roofs, roads, parking lots and compact soils.

Interior habitat: A point where edge effects no longer influence environmental conditions within an ecosystem. The effects usually involve light intensity, temperature, wind, relative humidity and snow accumulation and melt. In a forest ecosystem, edge habitat is often considered to extend at least 200 m and for some species up to 400 m from the edge of the forest, so very large patches are needed before 'interior habitat' is present.

Invasive species: Plants, animals and micro-organisms that colonise and take over the habitats of native species. Most invasive species are also alien (non-native) to the area, and can become predominant because the natural controls (predators, disease, etc.) that kept populations in check in their native environment are not found in their new location.

Islandisation: The process by which disturbance results in an ecosystem becoming isolated from surrounding ecosystems. The remnant ecosystem becomes an 'island' in a sea of development.

LEED™: The LEED (Leadership in Energy and Environmental Design) Green Building Rating System™ is a voluntary, consensus-based national standard for developing high-performance, sustainable buildings.

Naturescape: A way of restoring, preserving and enhancing wildlife habitat in urban and rural landscapes by providing wildlife habitat in our homes and gardens. See the Naturescape website for details.

Restrictive covenant: A covenant between the landowner and the Province of British Columbia (and/or local government) which restricts certain activities that may occur on that land. The covenant is registered against the property title under section 219 of the Land Title Act.

Sediment: material carried in suspension by a flowing body of water which will ultimately settle to the bottom as water velocity decreases.

Species at risk: A species that has been defined as 'at risk' by either the federal or provincial government.

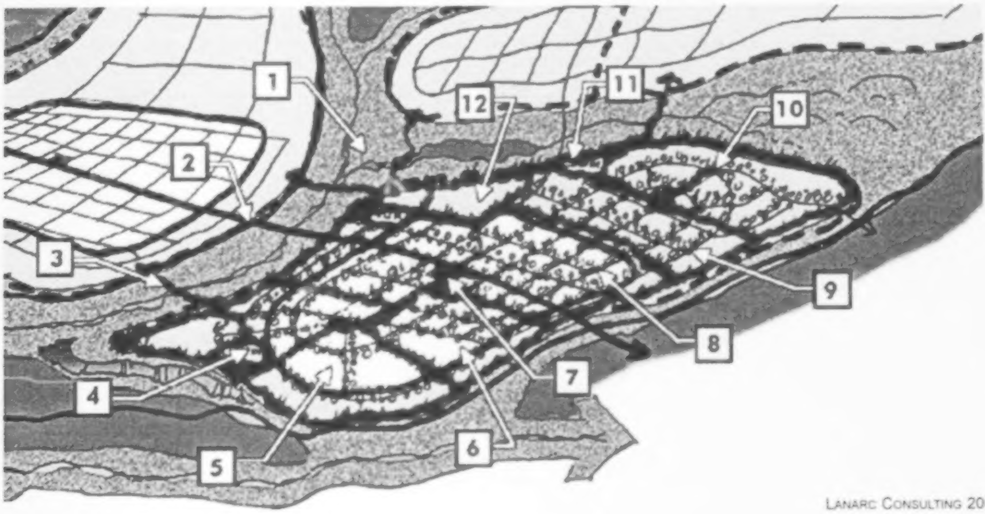
- Federally listed: The federal Committee on the Status of Endangered Wildlife in Canada (COSEWIC) maintains a list of species listed as extirpated, endangered, threatened or of special concern. These species are protected under the *Species at Risk Act.*
- Provincially ranked: The British Columbia government maintains a ranking of species considered to be "red-listed" and "blue-listed" in this province.

Wildlife: Any wild organism including wild mammals, birds, reptiles, amphibians, fishes, invertebrates, plants, fungi, algae and bacteria.

Wildlife corridor: A travel corridor for wildlife. These range from very wide, natural corridors for large mammals, to 'sky corridors' that offer a safe flight path between feeding and resting places for birds, to smaller man-made corridors (such as urban trails or culverts under roads) that provide safe passage for smaller creatures. These corridors also provide year-round habitat for less mobile species.

Xeriscaping: A landscaping approach using plant species that are tolerant of drought conditions.

## APPENDIX 3-2: IDEALISED NEIGHBOURHOOD PLAN



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1. Riparian areas and other buffers are maintained in their natural state, with management programs to mitigate for human, dog and invasive species impacts.
2. Road, trail and utility crossings of watercourse and riparian areas are kept to a minimum and crossing points are chosen for low impact, in particular to avoid critical habitats of sensitive species.
3. Pedestrian/cycle and road crossings of watercourses have a low impact design; i.e., boardwalk or bridge.
4. Constructed stormwater wetlands are integrated with community parks and schools, but constructed outside of riparian or other environmentally sensitive areas.
5. Private development and institutions incorporate naturescape principles and source controls for stormwater management, erosion control and spill management.
6. Light industrial and commercial areas include work/living space to minimise car use, and green roofs and other best management practices to mitigate stormwater runoff.
7. The town square is a best management practices showpiece and transit hub. It and adjacent high density buildings have pervious paving and absorbent landscape over parking structures.
8. An interconnected grid street system encourages walking, cycling and transit use.
9. Local streets are tree and boulevard lined, and designed to absorb stormwater runoff into the ground.
10. A system of walk/bike trails and greenways outside the protected areas links neighbourhoods to amenities, and provides corridors of native vegetation that are routes for surface flows of stormwater.
11. An Urban Containment Boundary and related zoning avoids development pressure on environmentally sensitive areas and resource lands.
12. At the elementary school, the adjacent environmentally sensitive areas provide a natural backdrop and outdoor classroom, but the school's naturescape garden, playing fields, and trail connections are separated from the environmentally sensitive areas by a carefully designed barrier.

THIS IS PART OF A SERIES OF BEST MANAGEMENT PRACTICES DOCUMENTS

# Environmental Best Management Practices for Urban and Rural Land Development

4

June 2004

## Section Four

# ENVIRONMENTAL PLANNING AND DEVELOPMENT AT THE SITE LEVEL

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BRITISH COLUMBIA
Ministry of Water, Land and Air Protection
Ecosystem Standards and Planning
Biodiversity Branch

## Summary

Best management practices for environmental planning and development at the site level include:

### COMMUNITY AND WATERSHED CONTEXT

- Plan site development in a community context

### DETAILED SITE INVENTORY

- Identify environmental features before designing the development
- Identify hazard lands

### SITE PLANNING AND DESIGN

- Avoid development in sensitive areas
- Design the development to retain important ecosystem features
- Design the development to retain important ecosystem functions
- Retain buffers around sensitive areas
- Connect habitat areas with wildlife corridors
- Design the site to maintain the hydrology and water quality
- Plan trails carefully
- Create 'green' buildings

### DURING DEVELOPMENT

- Protect ecosystem features and functions during construction
- Use natural landscaping techniques

### PROTECTION AFTER DEVELOPMENT

- Retain natural ecological processes
- Monitor environmental impacts

### RESTORATION AND ENHANCEMENT

- Restore and enhance habitats
- Avoid or minimise the use and spread of non-native vegetation, especially invasive plant species

### CREATION OF NEW HABITATS

- Create new habitats in rural areas
- Create and maintain habitats in urban areas

### STORMWATER MANAGEMENT

- Put water back in the ground
- Preserve or improve water quality
- Hold back water through rate control or detention

### EROSION AND SEDIMENT CONTROL

- Develop an erosion and sediment control plan
- Control erosion and sediment during construction

### WILDFIRE CONSIDERATIONS

- Reduce risk from wildfires

### WILDLIFE HUMAN CONFLICTS

- Site developments to avoid conflicts
- Remove or reduce wildlife attractants

# Environmental Planning and Development at the Site Level

"Wildlife" includes all wild plants AND animals.

This section of *Environmental Best Management Practices for Urban and Rural Land Development* is written for people who are responsible for urban and rural land development at the site level— local governments, the development community and landowners.

Sections 5–7 discuss urban and rural land development on sites that are highly sensitive, because they are environmentally sensitive areas, habitats for special wildlife and species at risk, and/or aquatic and riparian ecosystems. This section discusses environmental planning and development for other urban and rural development sites. Although these sites may be deemed less environmentally sensitive, they may still play a significant role in the local environment and are important for biodiversity and community greenspace.

Site-level planning should reflect community and landscape level planning, as discussed in Section 3: Environmental Planning at the Community Level.

## 4.1 BENEFITS OF ENVIRONMENTAL PROTECTION AT THE SITE LEVEL

Woodpeckers like standing dead trees.
PHOTO: TRUDY CHATWIN

Good environmental planning at the site level brings many benefits to the community, the local government and the developer. For example:

- Retention of trees and green space helps to increase property values and create properties that are more desirable;
- Integrated stormwater management can reduce the costs associated with traditional stormwater management approaches;
- Urban trees provide services such as reducing air pollution, cooling in the summer and protection from winter storms as well as providing habitat for birds and bats that keep insect populations in check; and
- Walking and cycling pathways in communities encourage reduced use of vehicles (helping to reduce greenhouse gases) and provide a community that people enjoy living in.

For more information, see Appendix A: Benefits of Environmental Protection.

**DEVELOPERS BENEFIT FROM ENVIRONMENTAL PROTECTION**

- Higher prices: Homeowners are willing to pay a premium of 5–15% (and sometimes more) for properties near natural open space (*Quayle and Hamilton 1999, Curran 2001*).
- Faster approvals: Developers can spend a great deal of time (and money) in the approvals process. Where a proposed development has clear environmental benefits, it is more likely to have public support and approval, and will move faster through the approval process (*Curran 2001*).
- Faster sales: Houses sell more quickly where they are close to greenspace. For homebuyers, access to natural open space is one of the most important features in a residential neighbourhood (*Quayle and Hamilton 1999, Curran 2001*).
- Marketing edge: The U.S. National Association of Homebuilders encourages the planting of trees because this increases the marketability of new developments (*Petit 1998*).

For more information, see **Appendix A: Benefits of Environmental Protection.**

## 4.2 OBJECTIVES

**THE MINISTRY'S GOALS ARE TO:**

- Maintain and restore the ecological diversity of fish and wildlife species and their habitats; and
- Protect the environment and human health and safety by ensuring clean and safe water, land and air.

Local governments and the development community should meet the following environmental objectives during urban and rural land development:

- Develop and implement site plans that protect biodiversity, clean air and clean water, for the benefit of the current and future residents and the flora and fauna of the community;
- Gather inventory information that identifies:
  - All **environmentally sensitive areas**[1] on and near the site, including terrestrial, aquatic and riparian ecosystems;
  - All known **species at risk** on and near the site, including both **federally-listed** and **provincially-ranked** species;
  - **Wildlife corridors**;
  - **Hazard lands**, including areas subject to flooding, erosion, wildfire and 'problem' wildlife; and
  - **Hydrology** and **soil morphology**.
- Design developments that protect and enhance environmentally sensitive areas, habitat for plants and animals (including common species and species at risk) and wildlife corridors, including concentrating developments in alternate sites where necessary;
- Locate developments away from areas that may be subject to erosion, flooding, wildfires and undesirable human-wildlife encounters;
- Prevent and manage adverse effects on the air, water and land quality through pollution prevention, management of stormwater, and waste management; and
- Work with the community to maximise the benefits of good environmental planning at the community and site level.

Local governments should address these issues within their Official Community Plan and other planning and public consultation processes. Developers should be able to demonstrate to local governments and the public how they have addressed these concerns and incorporated them into their development before, during and after the construction process.

## 4.3 LEGAL REQUIREMENTS

Urban and rural land developments at the site level are governed by several Acts and regulations:

- The British Columbia *Wildlife Act* provides protection for all wildlife.
- The B.C. *Fish Protection Act* and Streamside Protection Regulations regulate setbacks from streams and other watercourses.

[1] Definitions are provided in Appendix 4-1 and in the Glossary

The Streamside Protection Regulation is currently under review. For more information see http://wlapwww.gov.bc.ca/habitat/fish_protection_act/index.html

- The federal *Species at Risk Act* provides for the protection of federally listed species at risk and their critical habitats.
- The federal *Fisheries Act* provides penalties for destruction or degradation of fish habitat, including sediment and riparian clearing.
- The federal *Migratory Bird Convention Act* provides penalties for possessing birds or nests.
- The *Canada Wildlife Act* prohibits possession or harming wildlife (including plants) except as permitted by regulations.

## 4.4 BEST MANAGEMENT PRACTICES

Best management practices for site-level environmental protection are centred on planning and designing to minimise environmental impacts, ensuring environmental protection during and after construction, and where possible enhancing and restoring natural features. The impacts of development will vary according to the type of ecosystem and site-to-site considerations, so the advice of an **appropriately qualified professional** is recommended.

### *4.4.1 Community and Watershed Context*

PLAN SITE DEVELOPMENT IN A COMMUNITY CONTEXT

Decisions made at a site-by-site level can affect the natural environment well beyond the boundaries of that site. The cumulative impact of seemingly innocuous decisions at the site level can cause major—and frequently unintended—results.

Proposals for land development at the site level should consider the potential impacts on the environment at the larger scale. How is the site in question part of the environmental 'big picture'? What impacts would changing the hydrology of an area have on downslope floodplains, wetlands and aquatic ecosystems? Would the development **fragment** wildlife habitat or affect wildlife movement patterns?

☑ Ensure that site level plans and design meet or exceed the environmental goals and objectives at the community or watershed level. If there are no specified community or watershed level plans, ensure that the site development will not negatively impact on neighbouring properties.

☑ Identify potential off-site impacts prior to development, and design the development to avoid or mitigate these impacts.

### *4.4.2 Detailed Site Inventory*

IDENTIFY ENVIRONMENTAL FEATURES BEFORE DESIGNING THE DEVELOPMENT

**Environmental mapping and inventory should be conducted before designing the development layout and before initiating land clearing activities.**

☑ Gather available information from community or regional level mapping and inventories, including local government environmental atlases where they exist. Information may be available about the site through Sensitive Ecosystem Inventories, Fish Wizard, Sensitive Habitat Inventory and Mapping, Ministry of

Water, Land and Air Protection regional websites and other regional and local information sources (see Appendix B: Sources for Environmental Mapping and Inventory). Not all maps and inventories are digitally available—seek out other documented information including unpublished sources.

☑ The Conservation Data Centre (CDC) is also a useful source of information for identifying known and potential occurrences of special wildlife or species at risk in your area (you can request information on species of concern for a specific area). Coverage by the CDC is not equally good in all areas so be aware that a lack of CDC listing does not mean the species is not found in that location.

☑ Review available information to determine whether additional information needs to be gathered. Remember that regional mapping is at a scale that may miss important sites—just because no environmentally sensitive area is identified does not mean that there are no ecological values on that site. Lack of inventory also does not indicate a lack of sensitive habitats or species.

☑ If the available information is inadequate for site level planning (or has gaps), have a detailed **bio-inventory** of the site prepared by an appropriately qualified professional. The report should include identification of all environmentally sensitive areas, important wildlife habitats, wildlife corridors, the presence of any species at risk, recommended buffers, links to adjacent greenspaces, site hydrology, soil morphology and other information. Note that the timing of the bio-inventory is important, as some species may only be visible or may only use the area at certain times of year. In some cases it may be necessary to inventory the site in more than one season to fully assess its ecological values. For suggested Terms of Reference for the development of a bio-inventory, see Appendix C: Terms of Reference for Bio-Inventory.

☑ Provide the results of the bio-inventory to the local government, and any findings of species at risk to the Conservation Data Centre and regional Ministry of Water, Land and Air Protection species at risk staff.

☑ If community level information is not available, use air photos or other means to identify ecological values on surrounding lands.

Locate developments away from areas subject to flooding.
PHOTO: MARLENE CASEY

#### IDENTIFY HAZARD LANDS

Use terrain stability mapping and floodplain mapping to identify potential hazard areas.

### *4.4.3 Site Planning and Design*

#### AVOID DEVELOPMENT IN SENSITIVE AREAS

☑ Design the development to avoid sensitive areas and their buffers (see below).

☑ For aquatic and riparian ecosystems (e.g. wetland, streamside and coastal areas), environmentally sensitive areas, and habitat areas for special wildlife and species at risk, follow the identified best management practices (see Sections 5–7).

☑ Work with the local government to identify suitable planning tools and incentives to protect sensitive areas and buffers. Options may include:

- Conservation covenants
- Parkland dedication
- Management agreements
- Acquisition by the local government or a land trust
- Density transfer or bonusing

For more information see *Giving It Away: A Guide to Best Practices for Conservation Covenants*, *The HAT Manual: Protecting Natural Areas in the Capital Region*, the *Eco-gifting website* and *Green Legacies: A Donor's Guide for B.C.*

### DESIGN THE DEVELOPMENT TO RETAIN IMPORTANT ECOSYSTEM FEATURES

Ecosystem **features** are the physical attributes that create many different types of habitat for different species. For example, snags (standing dead trees), ground cover, and large woody debris in streams are all ecosystem features.

To protect ecosystems—and the plants and animals that live in them—we need to protect the ecosystems' **features** AND **functions**.

☑ Consider cluster housing to maximise retention of greenspace and sensitive habitats.

☑ Design the site to maintain treed fence lines, hedgerows and windbreaks, and ensure that they are connected to forest patches, backyard habitats and/or large **habitat reservoirs**. They form wildlife corridors and **edge habitat** for many wildlife species.

☑ Design green patches to maximise habitat values. In general, round patches provide better **interior habitat**, which is vital for some native birds that depend on forest interiors for protection from predators, nesting and/or feeding. Along streams, long strips of habitat provide wildlife corridors as well as habitat for many native species.

☑ Design buildings, infrastructure and other development so that established trees can be retained, with enough distance to protect the root systems. The tree's 'drip line' (the extent of the branches) can be used as an approximate guide to the area of root systems. Mature trees add to the property value.

☑ If hazard trees need to be removed, follow the guidelines of the *Best Management Practices for Hazard Tree and Non-Hazard Tree Limbing, Topping or Removal.*

☑ Avoid **fragmenting**[1] wildlife habitats.

☑ Develop a 'site map' of these features to be referred to during construction.

### DESIGN THE DEVELOPMENT TO RETAIN IMPORTANT ECOSYSTEM FUNCTIONS

Ecosystem **functions** are the processes that keep an ecosystem operating. Examples include infiltration of surface water, evapo-transpiration, and nutrient cycling.

☑ Maintain natural hydrologic cycles in wetlands, ponds, streams and natural seepage areas to retain biodiversity and wetland function.

☑ Build well away from floodplains and allow natural flooding cycles to occur so that flood-dependant ecosystems can persist. Some wildlife species depend on the ecosystems that develop in response to natural flooding.

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[1] For a discussion of fragmentation, see Section 3.4.4: Ecosystem and Species Protection

### TABLE 4-1: TARGET BUFFER DISTANCES

This table provides suggested **minimum** buffer distances for some species and ecosystems. These distances are based on scientific research and professional observation, and are intended to minimise disturbance to the species or ecosystem in question. The target buffer for undeveloped lands is larger than for rural and urban lands. In undeveloped areas, animals have likely had less contact with humans and are less tolerant of human presence. In urban areas, the distances are smaller, recognising that species and ecosystems have likely developed greater tolerance to human activity, and also that the high demand for land may preclude large buffers. During their breeding season, birds are especially sensitive to activities such as machine landscaping and construction. If construction is taking place during the breeding season, the 'quiet' buffer is an **additional** buffer that should be used.

| | **Target Buffer Distances** | | | | |
|---|---|---|---|---|---|
| **Sensitive Feature** | **Measure buffer from** | **Undeveloped**[1] | **Rural**[2] | **Urban**[3] | **Breeding season "quiet" buffer**[4] |
| Eagle nests | The base of the tree | 200 metres | 100 metres | 1 1/2 tree lengths[5] | 100 metres |
| Other Raptors[6] nests | The base of the tree; cliff top or base | 500 metres | 200 metres | 1 1/2 tree lengths or 50m from cliff | 200 metres |
| Great Blue Heron nests[7] | A line drawn around the outer perimeter of all nest trees | 500 metres | 200 metres | 60 metres | 200 metres |
| Amphibians[8] | Outer perimeter of wetlands under fully saturated conditions | 150 metres | 100 metres | 30 metres | N/A |
| Reptiles[9] | Snake hibernacula; prime habitats | 150 metres | 100 metres | 30 metres | N/A |
| Riparian protection areas along all watercourses[10] | Top of Bank or high water mark if bank undefined[11] | 60 metres | 60 metres | Follow Streamside Protection Regulation[12] | N/A |
| Wetlands[13] | Measured from the outer perimeter | 150 metres | 100 metres | 30 metres | N/A |
| Sensitive ecosystems[14] | Measured from the outer perimeter | 200 metres | 60 metres | 30 metres | N/A |
| Species at risk | Follow the Recovery Plans or, where not available, an appropriately qualified professional's recommendations for each species | | | | |
| Bear habitat | Especially dens, primary feeding areas and travel corridors | Minimum block size of 20 ha including critical habitats | N/A | N/A | N/A |
| Moose/elk/bighorn sheep habitat | Especially high use areas – wetlands, winter and summer habitats | 500 metres | N/A | N/A | N/A |

## KEY TO TABLE 4-1

[1] "Undeveloped" applies to large tracts of undeveloped forest or grasslands, that are being developed into 5 hectare or smaller lot sizes.

[2] "Rural" applies to lots sizes from 1-5 ha that are being further subdivided.

[3] "Urban" applies to lots 1 ha or less that are being further subdivided.

[4] This is an additional buffer that should be used if land contouring or construction is taking place during nesting season.

[5] One and a half times the height of the tree.

[6] See *Best Management Practices Guidebook for Raptors in British Columbia* for species-specific recommendations.

[7] Ross Vennesland, Ministry of Water, Land and Air Protection. 2004. pers comm..

[8] See *Best Management Practices for Amphibians and Reptiles* for species-specific recommendations.

[9] See *Best Management Practices for Amphibians and Reptiles* for species-specific recommendations.

[10] Millar et al 1997.

[11] Top of Bank is defined in the Glossary.

[12] This applies whether or not the watercourse is fish-bearing.

[13] This includes ephemeral (seasonally dry) wetlands as well as open bodies of water. If amphibians or other species are present, use the largest of the suggested buffer widths. (Semlitsch and Bodie 2003).

[14] Where identified regionally.

### RETAIN BUFFERS AROUND SENSITIVE AREAS

**Buffers** are a leave area around a sensitive feature. Their purpose is to provide protection for that core feature by reducing the impact of potentially adverse effects from the outside. This can include access by humans and their pets, changes in microclimate, access by predators, etc. Buffers help to maintain the long term values—both environmental and economic—of an environmentally sensitive area.

Buffers should preclude permanent structures AND promote the retention of natural vegetation as part of the buffer.

The Ministry of Water, Land and Air Protection estimated that one Lower Mainland community could have avoided stormwater flooding damage of about $2.5 million on one stream alone had riparian buffers been left in place (*MWLAP 2001*).

☑ Establish buffers around all sensitive features. Target buffer widths are provided in Table 4-1. The Ministry also advises using an appropriately qualified professional to identify buffer widths, as circumstances may vary on a site by site basis.

☑ For Environmentally Sensitive Areas, Special Wildlife and Species at Risk and Aquatic and Riparian Ecosystems, see the information provided in Sections 5–7.

☑ In new developments, buffers should be of sufficient width to discourage access by humans and their pets to the environmentally sensitive area, reduce invasion by alien species and protect interior habitats from degradation. The width of the buffer will depend on its purpose and the sensitivity of the habitat you are trying to protect.

☑ In brownfield developments and re-developments, buffers should be as wide as possible to facilitate renewal of natural processes. Restoration of natural vegetation should be encouraged.

☑ Where park land is adjacent to the proposed development site, buffers should be placed as needed to prevent unacceptable impacts within the park.

☑ Set aside buffers as Crown or local government land where possible, as this makes long-term protection easier. For other options for the protection of these areas, see Avoid development in sensitive areas, Section 4.4.3. If the buffer is on private land, it should be protected and enforced using a conservation covenant or similar tool.

### Connect habitat areas with wildlife corridors

☑ Maintain and create wildlife corridors between the natural areas on the development site and those on adjacent properties. Riparian areas and natural gullies often function well as wildlife corridors. Other areas such as utility corridors and golf courses may provide corridors for some species.

**Wildlife Corridors**

"Wildlife corridors provide animals with an opportunity to move freely between two or more habitat patches or habitat types in an otherwise fragmented landscape. This movement is essential to provide genetic links between populations and prevent inbreeding, and to compensate for temporary population declines in one of the habitat patches. The habitat needs of all priority species should be incorporated into the design of the corridor. Corridors must be suitably wide, with appropriate habitat features to provide security cover during movement. Corridors usually consist of linear habitats such as streamside riparian areas, often composed of two or more ecosystem types to provide complexity to the corridor. Development and roads should avoid these zones, and mitigation will be required where roads and other developments transect the corridor" *(Clarke et al 2004)*.

### Design the site to maintain the hydrology and water quality

See also Section 4.4.7: Stormwater Management.

☑ Design the site so that the natural hydrological cycles (hydrographs) are maintained during and after development. Note that considerable baseline data may be needed to assess pre- and post- development conditions.

☑ Incorporate features that will minimise the amount of impervious surface and encourage groundwater recharge, such as narrower road widths, vegetated swales and pervious paving materials. For more details, see *Stormwater Planning: A Guidebook for British Columbia*, Chapter 7.

☒ Do not use local streams or wetlands for unmanaged stormwater discharge as the increased flows can significantly increase erosion.

**Impacts of Impervious Surfaces**

When rain falls on a forest floor, less than 1% flows directly overland into watercourses. About 55% soaks into the ground, moving into the groundwater or travelling through the ground into lakes and streams. About 45% is absorbed by plants or evaporates from the ground. Land development changes this water balance, creating hard impervious surfaces such as roads, parking lots and roofs. Following development, about 25%–75% of the rainfall goes directly into the stream via storm drains. This may create problems in the stream as the increased water quantity can cause erosion and destroy wildlife habitat, while the water quality deteriorates if the stormwater contains oils and other pollutants from the roads and driveways. Groundwater supplies also suffer as there is less groundwater recharge. (*Stormwater Planning: A Guidebook for British Columbia*)

PLAN TRAILS CAREFULLY

Trails in natural areas provide opportunities for the enjoyment of nature. However:

☑ Design trails and other accesses to avoid sensitive features such as ponds, wetlands, nesting sites and wildlife corridors.

☑ Ensure that trails do not fragment wildlife habitats.

☑ Keep hiking trails and walkways narrow so they do not prevent a barrier to movement of wildlife (such as reptiles and amphibians) and use elevated boardwalks or install "toad tunnels" to cross travel corridors.

☑ For more information on designing trails near sensitive features, see Access Near Aquatic Areas: A Guide to Sensitive Planning, Design, and Management and *Best Management Practices for Recreational Activities on Grasslands.*

CREATE 'GREEN' BUILDINGS

☑ Construct buildings to conform with **LEED™** (Leadership in Energy and Environmental Design) standards for 'green' buildings. For information on funding and standards for the building and retrofit of green buildings, see the Green Buildings B.C. program. For information on LEED™, see the LEED (Leadership in Energy and Environmental Design) Green Building Rating System™.

Protection is MUCH cheaper than restoration.

### 4.4.4 During Development

**Protection of existing ecosystems is MUCH cheaper than ecosystem enhancement and restoration. And, in many cases, it is not technically possible to restore ecosystems to their original functioning state.**

PROTECT ECOSYSTEM FEATURES AND FUNCTIONS DURING CONSTRUCTION

☑ Construct permanent or temporary fencing around sensitive features and their buffers.

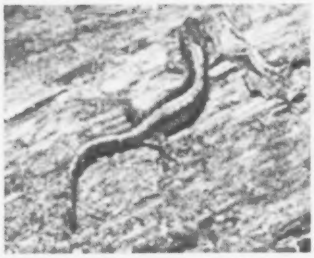
☑ Restrict land clearing or development activities between April 1 and July 31, to avoid disturbance or destruction during the active nesting period of most bird species, in compliance with the *Wildlife Act* (section 34c). Note that some species of birds have multiple broods and may be nesting outside of this time period.

Minimise the size of the cleared area.
PHOTO: TRUDY CHATWIN

☑ Retain as much natural vegetation as possible. Minimise the size of the cleared area required for construction.

☑ Prevent any disturbance within the root zone (drip line) of established trees.

☑ Preserve snags, downed logs, stumps and other forest features unless they present a danger to workers or the public. Consider topping any identified danger tree (at 5 m to 10 m or more) as an alternative to removal, and retaining this as a **wildlife tree**. Where hazard removal is unavoidable, the work should be as non-intrusive as possible. Felled trees should be left on the ground to provide habitat for wildlife including a wide variety of invertebrates. Note that a hazard tree *assessor* is the only qualified professional for assessing danger trees, but that this assessor may not be



Downed trees provide habitat for salamanders and other wildlife.
PHOTO: MARLENE CASKEY

sensitive to wildlife needs. For more information see *Best Management Practices for Hazard Tree and Non-Hazard Tree Limbing, Topping or Removal.*

USE NATURAL LANDSCAPING TECHNIQUES

☑ Use salvaged woody debris (logs, stumps) to enhance habitat in preserved patches and along wildlife corridors. This minimises disposal costs and enhances wildlife values.

☑ Use native plants and trees (suited to local climatic and terrain conditions) for landscaping as much as possible. This will minimise the possibility of introducing an invasive species, and will save money on maintenance costs as native species will be adapted to local climates (e.g. areas of summer drought or winter cold).

☑ Where possible use native plantings on public lands to demonstrate to residents the benefits of native plantings for maintenance and as wildlife habitat (i.e. demonstrate "**Naturescape**" principles).

☒ Never use any **invasive** species (e.g. English ivy, English holly, periwinkle, purple loosestrife, etc.) in landscaping, as these could spread into nearby natural areas and displace native vegetation and wildlife. As much as possible, remove any invasive species that are already on the development site. For more information see the Alien Species website.

☑ Use drought resistant species and very small lawns to minimise watering needs.

☑ Retain the natural soils and put them back onsite during landscaping.

☑ Ensure that all lawn areas have at least six inches of topsoil replaced after development is complete. This will promote deeper-rooted lawns and plants that will require less water in summer and be able to absorb more stormwater in winter.

☑ Reduce soil compaction by avoiding machinery use except where necessary.

☑ Obstruct pet access to sensitive habitats by constructing fencing and maintaining dense shrubby vegetation.

### 4.4.5 Protection After Development

RETAIN NATURAL ECOLOGICAL PROCESSES

Ecosystems, and the species that live in them, may be dependant on natural processes such as nutrient cycling, frequent or infrequent fires, or flooding.

☑ Ensure that the natural (pre-development) hydrological cycles are maintained during and after development. Changes in drainage patterns may impact wildlife, for example by putting year-round water into an area where species are adapted to summer droughts or by changing the quality of the water.

☑ Consider (where applicable) the development of plans that include low-intensity ground fires. Many species that inhabit these ecosystems need the old, open stands that were common to parts of British Columbia prior to current fire management regimes. **Controlled burns must only be carried out by an appropriately**

**qualified professional.** Frequent controlled burns will not be as hot as wildfires, posing considerably less risk to nearby homes. Controlled burning should be conducted as part of a well planned ecological restoration program within the context of the site being treated.

#### Monitor environmental impacts

☑ Develop monitoring programs to ensure designed terrestrial habitat protection measures are functioning as expected and implement changes where needed.

☑ Discourage activities that will damage natural ecosystems, such as throwing garden waste into ravines (which can destabilise slopes and cause slumping).

☑ Control recreational access to natural grassland areas, as even walking can damage both vegetation and thin soils. For further information on recreational activities on grasslands see *Best Management Practices for Recreational Activities on Grasslands.*

### 4.4.6 Restoration and Enhancement of Degraded Habitats

Some development sites have degraded habitats with the potential for restoration. The following best management practices provide guidance on restoration efforts.

Mature trees add to property value.
Photo: Marlene Caskey

#### Restore and enhance degraded habitats

☑ Work with an appropriately qualified professional to develop a site restoration plan for the specific site(s) being restored. This will include determining the appropriate state to restore the ecosystem to—for example, in a rural area the goal may be to re-create the natural ecosystem, whereas in a highly urbanised area the goal may be less ambitious.

Allow natural succession to proceed with minimal intervention or disturbance unless active management is needed to enhance or maintain habitat value or to control trees or brush that pose fire or safety hazards.

☑ Avoid and minimise the use and spread of alien vegetation, especially invasive plant species

☑ Discourage the occurrence and spread of invasive species. Active control methods include hand clearing, pruning, mowing, digging, and planting of appropriate native species to replace or shade out invasive species. Ongoing maintenance may be required.

### 4.4.7 Stormwater Management

Below are some of the principal best management practices for stormwater management at the site level. For detailed information on stormwater planning and management, refer to the guidelines from *Stormwater Planning: A Guidebook for British Columbia* (especially Chapter 7), *Standards and Best Practices for Instream Works* and the Water Balance Model.

PUT WATER BACK IN THE GROUND

- ☑ Establish performance targets for stormwater that are consistent with *Stormwater Planning: A Guide for British Columbia*.
- ☑ Retain natural water flows. Changes in surface drainage and groundwater flow patterns may adversely impact aquatic and riparian ecosystems and destabilise the banks. Changes in flow can also impact previously dry gullies by introducing seasonal flows.
- ☑ Minimise the amount of impervious surfaces by installing alternatives to asphalt for laneways, driveways, walkways, patios, etc. and building narrower roads.
- ☑ Encourage groundwater recharge through the use of vegetated swales, infiltration basins and the use of absorbent vegetation, and by disconnecting downspouts (where the terrain permits).

Lost Streams: Studies in the Lower Fraser Valley show that of the original 779 streams, 117 no longer exist, and that "most of the remaining 662 streams are under significant stress due to landscape alterations in watersheds, riparian zone degradation, and pollution, and are classified as threatened or endangered." *(Fraser River Action Plan 1997)*

PRESERVE OR IMPROVE WATER QUALITY

- ☑ Create engineered wetlands to filter pollutants before they can enter streams or creeks.
- ☑ Provide vegetated waterways (swales) or other measures to prevent the movement of road salts and other contaminants into sensitive habitats.
- ☑ Ensure that pollutants such as oil and other hydrocarbons are removed by oil/water separators before they enter the groundwater or streams.
- ☑ Minimise, or better yet avoid, the use of pesticides and fertilisers.

HOLD BACK WATER THROUGH RATE CONTROL OR DETENTION

- ☑ Use the Water Balance Model to assess stormwater volumes and identify appropriate source controls.

### *4.4.8 Erosion and Sediment Control*

Erosion and sediment control can be a significant issue on construction sites, as loss of materials from exposed soils can lead to charges under the *Fisheries Act* as well as creating problems with drainage systems.

Effective erosion and sediment control requires the use of a variety of techniques. For more information consult the Water Quality Municipal Best Management Practices for Construction Design website and/or hire an appropriately qualified professional.

DEVELOP AN EROSION AND SEDIMENT CONTROL PLAN

- ☑ Develop a plan for erosion and sediment control **before** construction begins. The plan should include:
  - Best management practices for source control and removal of contaminants from site runoff;
  - Detailed direction to contractors to ensure that no erosion or sediment movement will occur and that no silt will be released to watercourses during the construction and post construction phase; and

- The planting appropriate of native plant species of a size that will quickly re-establish riparian cover.

☑ In the construction and post-construction sediment and erosion control plan, recommend that an environmental consultant or other responsible party:

- Provide monitoring to ensure the sediment and erosion control plan is properly implemented during the course of clearing and construction;
- Ensure construction will proceed smoothly without harmful alteration of habitat; and
- Provide long-term monitoring for disturbed sites until green-up is established and the soils at the site are stable.

☑ If sensitive habitats may be at risk during the construction and development stage, hire an appropriately qualified professional to assist in planning and monitoring. Environmental consultants and monitors should be given the authority to halt all work if in their opinion on-site conditions will result in impacts to sensitive habitats.

The Greater Vancouver Regional District's Stormwater Best Management Practices Guide includes many recommendations for erosion and sediment control: http://www.gvrd.bc.ca/sewerage/management_guide.htm

### CONTROL EROSION AND SEDIMENT DURING CONSTRUCTION

☑ Construct and stabilise runoff management systems at the beginning of site disturbance and construction activities.

☑ Minimise disturbed areas and stripping of vegetation and soils, particularly on steep slopes, and stabilise denuded soils as soon as possible. Re-vegetate promptly once foundation work is complete

☒ Do not open up sites when the weather is likely to be rainy or during snowmelt. Retain as much of the natural vegetation cover as possible.

☑ Consider additional stormwater runoff requirements for projects constructed during the rainy season.

☑ Require stabilised site entrances with provisions to prevent tracking of mud and debris off site.

☑ Roughen and/or terrace slopes to prevent erosion.

☑ Ensure proper containment and disposal of concrete wash water.

☑ Use temporary coverings (plastic sheets) for soil stockpiles and bare slopes, and surface mulches, including leaves and straw, to provide erosion control from raindrop erosion. Control of sheet, rill and gully erosion requires management of surface flows.

☒ Avoid the collection, conveyance and concentration of surface water by encouraging it to seep into the soil.

☑ Inspect the construction site regularly to determine compliance with requirements.

### *4.4.9 Wildfire Considerations*

Wildfires are a natural process of B.C.'s forests and grasslands. For detailed information on reducing risk from wildfires, see *FireSmart: Protecting Your Community from Wildfire*.

REDUCE RISK FROM WILDFIRES

☑ Install sprinkler systems in new homes that are close to areas of wildfire hazard.

☑ Support the restoration of natural disturbance regimes in local forests so that fuel loadings and the risk of crown fires are reduced.

☑ Minimise the build up of fuels (wood piles, deserted out buildings, etc.) in and around home sites.

☑ Rake up litter close to homes as an additional fire prevention/restoration tool.

☑ With an appropriately qualified professional, investigate options for prescribed burning. **Note: Burns close to homes can be hazardous and, improperly managed, can do more harm than good. They should only be conducted with professional advice.**

### 4.4.10 Wildlife Human Conflicts

When we build communities, we do so in places that are the homes of many different species of wildlife. Native plants and trees are replaced by roads, building and lawns, and many of the reclusive animals die out or move elsewhere. Some 'pest' species remain, or move in to the area, to benefit from the human activities. 'Garbage bears' and opportunistic wildlife such as racoons can become a problem.

Site developments to avoid wildlife conflicts.
PHOTO: MINISTRY OF WATER, LAND AND AIR PROTECTION

SITE DEVELOPMENTS TO AVOID CONFLICTS

☒ Do not build on or near wildlife corridors and other well-frequented wildlife habitats (especially those used by large predators such as bear and cougar, and other potentially dangerous species such as rattlesnakes).

☑ Recognise that old orchards can attract bears and other wildlife and locate developments accordingly.

☑ Consider possible wildlife conflicts when siting trails around or near developments.

REMOVE OR REDUCE WILDLIFE ATTRACTANTS

☑ Minimise human-wildlife conflicts, for example by harvesting orchards that may attract problem bears. For more information on ways that communities have dealt with problem bears, see Get Bear Aware.

☑ Build covered areas for garbage that are designed to keep out problem species such as bear, skunk and rats. Spilled garbage attracts crows and raccoons, which prey on sensitive wildlife such as reptiles, amphibians and songbirds. Recent amendments to the *Wildlife Act* make it illegal to improperly manage garbage.

### 4.4.11 Pollution Prevention

For best management practices on pollution prevention see Section 8: Pollution Prevention.

## 4.5 USEFUL SOURCES

*For complete references and a more extensive reading list, see the Bibliography.*

### LEGISLATION:

For a full listing of **provincial government legislation**, see http://www.qp.gov.bc.ca/statreg/list_statreg_l.htm

B.C. *Wildlife Act*: http://www.qp.gov.bc.ca/statreg/stat/W/96488_01.htm

B.C. *Fish Protection Act*: http://www.qp.gov.bc.ca/statreg/stat/F/97021_01.htm

Streamside Protection Regulations: http://www.qp.gov.bc.ca/statreg/reg/F/FishProtect/10_2001.htm

For a full listing of **federal government legislation**, see: http://laws.justice.gc.ca/en/

Canada *Species at Risk Act*: http://www.sararegistry.gc.ca/the_act/default_e.cfm

Canada *Fisheries Act*: http://laws.justice.gc.ca/en/F-14/

Canada *Wildlife Act*: http://laws.justice.gc.ca/en/W-9/

Canada *Migratory Birds Convention Act*: http://laws.justice.gc.ca/en/M-7.01/

### INVENTORY AND MAPPING:

Conservation Data Centre http://srmwww.gov. c.ca/cdc/index.html

Conservation Data Centre known occurrences: ttp://srmwww.gov.bc.ca/cdc/access.html

Conservation Data Centre data requests: http://sr www.gov.bc.ca/cdc/request.html

Conservation Data Centre report of findings: http://srmwww.gov.bc.ca/cdc/contribute.html

Sensitive Ecosystems Inventories (http://srmwww.gov.bc.ca/sei/index.html) are currently available for East Vancouver Island and Gulf Islands; Sunshine Coast; Bowen and Gambier Islands; Central Okanagan; and Bella Vista Goose Lake (North Okanagan).

Sensitive Habitat Inventory and Mapping (part of the Community Mapping Network): http://www.shim.bc.ca/maps2.html

Resource Information Standards Committee http://srmwww.gov.bc.ca/risc/standards.htm

Terrain stability mapping: http://srmwww.gov.bc.ca/terrain/inventory/stability/index.html

Floodplain mapping: http://srmwww.gov.bc.ca/aib/fpm/

For area-specific inventories see Appendix B: Sources for Environmental Mapping and Inventory.

### BEST MANAGEMENT PRACTICES

These Best Management Practices documents will be posted on the Ministry of Water, Land and Air Protection website (http://wlapwww.gov.bc.ca/wld/BMP/bmpintro.html) in the near future. Some drafts are available for review on other websites, or from Ministry offices, as noted below. Comments on these drafts can be sent to Marlene Caskey (Marlene.Caskey@gems7.gov.bc.ca) or Dr. Grant Bracher (Grant.Bracher@gems2.gov.bc.ca).

*Best Management Practices for Recreational Activities on Grasslands*

*Best Management Practices for Amphibians and Reptiles in Urban and Rural Environments in British Columbia*: http://www3.telus.net/public/leahmalk/BMP.pdf

*Standards and Best Practices for Instream Works:* http://wlapwww.gov.bc.ca/sry/iswstdsbpsmarch2004.pdf

*Best Management Practices Guidebook for Raptors in British Columbia: Guidelines for integrating raptor conservation with urban and rural developments*

*Best Management Practices for Hazard Tree and Non-Hazard Tree Limbing, Topping or Removal.* Ministry of Water, Land and Air Protection, Okanagan Region. Penticton, B.C. For a copy contact Susan Latimer, Susan.Latimer@gems1.gov.bc.ca

To contact regional Ministry of Water, Land and Air Protection offices see http://wlapwww.gov.bc.ca/main/prgs/regions.htm

### STEWARDSHIP PUBLICATIONS:

All of the publications in the Stewardship Series are available at http://www.stewardshipcentre.bc.ca/sc_bc/stew_series/bc_stewseries.asp. These include:

*Access Near Aquatic Areas: A Guide to Sensitive Design, Planning and Management*
*Coastal Shore Stewardship: A Guide for Planners, Builders and Developers*
*Green Legacies: A Donor's Guide for B.C.*
*Naturescape: British Columbia: Caring for Wildlife Habitat at Home*
*Stewardship Options for Private Land Owners in British Columbia*

### TOOLS FOR NATURAL AREA PROTECTION

Habitat Acquisition Trust. 2004. The *HAT Manual: Protecting Areas in the Capital Region.* Habitat Acquisition Trust, Victoria, B.C. http://www.hat.bc.ca/projects/planning.htm

Environment Canada Eco-gifting website: http://www.cws-scf.ec.gc.ca/ecogifts/intro_e.cfm

Hillyer, A. and J. Atkins. 2000. *Giving It Away: A Guide to Best Practices for Conservation Covenants.* West Coast Environmental Law Research Foundation, Vancouver, B.C. http://www.wcel.org/resources/publications/default.cfm

### SMART GROWTH

Curran, D. and M. Leung. 2000. *Smart Growth: A Primer.* Smart Growth British Columbia and University of Victoria Eco-Research Chair of Environmental Law and Policy, Victoria B.C. http://www.smartgrowth.bc.ca

Smart Growth B.C. 2001. The *Smart Growth Toolkit: Helping to create more livable communities in British Columbia.* For this and other Smart Growth B.C. publications, see http://www.smartgrowth.bc.ca

### INVASIVE AND ALIEN SPECIES

Alien species in British Columbia: http://wlapwww.gov.bc.ca/wld/aliensp/index.html

Fraser Basin Council. 2004. *Invasive Plant Strategy for British Columbia.* Fraser Basin Council, http://www.fraserbasin.bc.ca

### STORMWATER MANAGEMENT:

*Stormwater Planning: A Guidebook for British Columbia*
http://wlapwww.gov.bc.ca/epd/epdpa/mpp/stormwater/stormwater.html

Water Balance Model: http://www.waterbalance.ca

### WILDFIRE

FireSmart: Protecting Your Community from Wildfire:
http://www.partnersinprotection.ab.ca/downloads/

### WILDLIFE

Get Bear Aware: http://wlapwww.gov.bc.ca/eeeb/info/bearaware/home/index.htm

### GREEN BUILDINGS

Green Buildings B.C. program: http://www.greenbuildingsbc.com/

LEED (Leadership in Energy and Environmental Design) Green Building Rating System™:
http://www.usgbc.org/LEED/LEED_main.asp

### EROSION AND SEDIMENT CONTROL

Atkins, R.J., M.R. Leslie, D.F. Polster, M.P. Wise and R.H. Wong. 2000. "Best Management Practices Handbook: Hillslope Restoration in British Columbia." Watershed Restoration Technical Circular No. 3 (Revised). B.C. Ministry of Forests. Victoria, B.C.
http://www.for.gov.bc.ca/hfd/pubs/Docs/Mr/Mr096.htm

Coulter, T. S. and D. R. Halladay. 1997. "Control of Erosion and Shallow Slope Movement Manual." Unpublished report prepared by Thurber Environmental Consultants Ltd. for B.C. Ministry of Transportation and Highways, Victoria, B.C.

Greater Vancouver Regional District. 1999. Stormwater Best Management Practices Guide.
http://www.gvrd.bc.ca/sewerage/management_guide.htm

United States Department of Agriculture. 1994. Planning and Design Manual for the Control of Erosion, Sediment and Stormwater. http://www.abe.msstate.edu/csd/p-dm/index.html

Water Quality Municipal Best Management Practices website:
http://wlapwww.gov.bc.ca/wat/wq/nps/BMP_Compendium/Municipal/Municipal_Home.htm

## APPENDIX 4-1: DEFINITIONS

See also Glossary

Alien species: Plants, animals and micro-organisms from one part of the world that are transported beyond their natural range and become established in a new area. They are sometimes also called "exotic," "introduced," "non-native," or "non-indigenous" species. Some alien species are also **invasive species**.

Appropriately qualified professional: A scientist or technologist specialising in a relevant applied science or technology including, but not necessarily limited to, agrology, forestry, biology, engineering, geomorphology, geology, hydrology, hydrogeology or landscape architecture, and who is registered in British Columbia with their appropriate professional organisation, and acting under that association's Code of Ethics and subject to disciplinary action by that association, and who, through demonstrated suitable education, experience, accreditation and knowledge relevant to the particular matter, may be reasonably relied on to provide advice within their area of expertise.

Bio-inventory: A detailed site assessment that documents plant communities, aquatic and wildlife habitat values, aquatic and wildlife species presence (or likelihood of presence), sensitive ecosystems, rare ecosystems, rare species, adjacent land uses and threats, site stability and flood issues, other factors affecting lot layout, and where appropriate, potential habitat enhancement/protection opportunities. Terms of reference for a bio-inventory are included in Appendix C: Terms of Reference for a Bio-Inventory.

Buffer: An area of land that surrounds and protects a sensitive feature from the adverse effects of activities on, or encroachments from, adjacent land.

Edge habitat: The point at which dissimilar plant communities (different vegetation types, successional stages or vegetative conditions) meet. Many species have adapted to the interface between the two habitats.

Ecosystem features: The physical components of the ecosystem (such as snags and large woody debris) that help maintain the diversity and processes associated with a healthy ecosystem.

Ecosystem functions: The physical, chemical and biological processes that keep an ecosystem operating. Examples include infiltration of surface water, evapo-transpiration and nutrient cycling.

Environmentally sensitive area: A term often used loosely to mean a site or area that has environmental attributes worthy of retention or special care. A more exacting definition is: any parcel of land that already has, or with remedial action could achieve, desirable environmental attributes. These attributes contribute to the retention and/or creation of wildlife habitat, soil stability, water retention or recharge, vegetative cover and similar vital ecological functions. Environmentally sensitive areas range in size from small patches to extensive landscape features. They can include rare or common habitats, plants and animals. Areas requiring special management attention to protect fish and wildlife resources, other natural systems or processes, and/or historical, cultural or scenic values. Environmentally sensitive areas also include hazard lands.

Fragmentation: A process whereby large contiguous ecosystems are transformed into one or more smaller patches surrounded by disturbed areas.

Groundwater recharge: The movement of rainwater down through the soil and into the groundwater and aquifers beneath.

Habitat reservoir: A large area of relatively natural habitat that has sufficient size and ecological integrity to support a range of native species, including species that need interior habitats. The size of habitat reservoir depends on the species being managed for. Habitat reservoirs are often hotspots of biodiversity in or near disturbed urban and rural landscapes.

Hazard lands: Lands that may be subjected to terrain hazards (flooding, landslides, debris flows, avalanches, etc.)

Hydrology: The science of water, its properties and movement (water cycle) over and under land surfaces.

Impervious surface: Hard surfaces that do not permit water to flow through to the ground beneath.

Interior habitat: A point where edge effects no longer influence environmental conditions within an ecosystem. The effects usually involve light intensity, temperature, wind, relative humidity and snow accumulation and melt. In a forest ecosystem, edge habitat is often considered to extend at least 200 m and for some species up to 400 m from the edge of the forest, so very large patches are needed before 'interior habitat' is present.

Invasive species: Plants, animals and micro-organisms that colonise and take over the habitats of native species. Most invasive species are also alien (non-native) to the area, and can become predominant because the natural controls (predators, disease, etc.) that kept their populations in check in their native environment are not found in their new location.

LEED™: The LEED (Leadership in Energy and Environmental Design) Green Building Rating System™ is a voluntary, consensus-based national standard for developing high-performance, sustainable buildings.

Naturescape: A way of restoring, preserving and enhancing wildlife habitat in urban and rural landscapes by providing wildlife habitat in our homes and gardens. See the Naturescape website for details.

Soil morphology: The form and structure of the soil, including its mineral and biological (dead organic matter) content.

Species at risk: A species that has been defined as 'at risk' by either the federal or provincial government.

- Federally listed: The federal Committee on the Status of Endangered Wildlife in Canada (COSEWIC) maintains a list of species listed as extirpated, endangered, threatened or of special concern. These species are protected under the *Species at Risk Act.*
- Provincially ranked: The British Columbia government maintains a ranking of species considered to be "red-listed" and "blue-listed" in this province.

Wildlife corridor: A travel corridor for wildlife. This ranges from very wide, natural corridors for large mammals, to 'sky corridors' that offer a safe flight path between feeding and resting places for birds, to smaller man-made corridors (such as urban trails) that provide safe passage for smaller creatures. These corridors also provide year-round habitat for less mobile species.

| | |
|---|---|
| Wildlife trees: | A standing live or dead tree with special characteristics that provide valuable habitat for the conservation or enhancement of wildlife. Characteristics include large diameter and height for the site, current use by wildlife, declining or dead condition, value as a species, valuable location and relative scarcity. |

THIS IS PART OF A SERIES OF BEST MANAGEMENT PRACTICES DOCUMENTS

# Environmental Best Management Practices for Urban and Rural Land Development

5

June 2004

## Section Five

## ENVIRONMENTALLY SENSITIVE AREAS

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## Summary

Environmentally sensitive areas need to be protected from development. Best management practices include:

### DETAILED SITE INVENTORY

- Determine if there are environmentally sensitive areas on or near the proposed development site

### SITE PLANNING AND DESIGN

- Design the development to retain environmentally sensitive areas
- Create buffers around environmentally sensitive areas
- Link environmentally sensitive areas to nearby greenspaces using wildlife corridors
- Design carefully for recreational use

### PROTECTION DURING DEVELOPMENT

- Avoid disturbing the environmentally sensitive area during development

### PROTECTION AFTER DEVELOPMENT

- Limit access to environmentally sensitive areas
- Use environmentally-friendly landscaping
- Retain natural ecological processes

### RESTORATION OF DISTURBED ENVIRONMENTALLY SENSITIVE AREAS

- Develop and implement a restoration plan

BRITISH COLUMBIA
Ministry of Water, Land and Air Protection
Ecosystem Standards and Planning
Biodiversity Branch

# Environmentally Sensitive Areas

Over one-third of B.C.'s at-risk species rely on grasslands for their survival. (*Grasslands Conservation Council*).

**Environmentally sensitive areas**[1] are places that have special environmental attributes worthy of retention or special care. These areas are critical to the maintenance of productive and diverse plant and wildlife populations. Examples include rare ecosystems (such as the Garry oak and associated ecosystems found in southwestern British Columbia), habitats for species at risk (such as sagebrush grasslands) and areas that are easily disturbed by human activities (such as moss-covered rocky outcrops). Some of these environmentally sensitive areas are home to species which are nationally or provincially significant, others are important in a more local context. They range in size from small patches to extensive landscape features, and can include rare and common habitats, plants and animals. For more information on ecosystems at risk see the Species and Ecosystems at Risk website.

This section focuses on terrestrial (land-based) environmentally sensitive areas. Most aquatic and riparian ecosystems, and any areas providing habitat for special wildlife and species at risk are also considered to be environmentally sensitive areas. For additional information on these areas see Sections 6 and 7. See also Section 3: Environmental Planning at the Community Level and Section 4: Environmental Planning and Development at the Site Level for information applying to other, less sensitive, terrestrial ecosystems.

## 5.1 BENEFITS OF ENVIRONMENTALLY SENSITIVE AREAS

Natural open space and walking/biking paths are among the four most important features for potential homebuyers (*Curran 2001*).

Environmentally sensitive areas can enhance the quality of places where people live, work and play.

Development proposals that demonstrate good environmental stewardship including the protection of environmentally sensitive areas help to create unique developments that have the community support to move efficiently though the planning and approvals process, and that sell quickly at premium prices. For more information, see Appendix A: Benefits of Environmental Protection.

### BUILDING OUTSTANDING VALUE

- **Improved value:** Properties adjacent to greenspace are worth 5 –15% more. This provides greater returns for the developer, and higher property taxes for the local government (*Quayle and Hamilton 1999, Curran 2001*).
- **Improved quality of life:** Residents enjoy living near greenspace, having a greater variety of birds at their feeders and having a quiet place to walk (*Habitat Acquisition Trust 2004)*.
- **Reduced development costs:** Where buildings are clustered to preserve greenspace, this translates into lower costs for land clearance and infrastructure (roads, sewers, etc.) (*Habitat Acquisition Trust 2004*).
- **Free services:** Ecological services such as stormwater management, production of oxygen, absorption of atmospheric pollutants and plant pollination are provided by healthy ecosystems— free of charge! (*McPhee et al 2000*)
- **Greater biodiversity:** Environmentally sensitive areas provide homes for a wide variety of plants and animals, including many species at risk (*McPhee et al 2000*).

For more information, see Appendix A: Benefits of Environmental Protection.

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[1] Definitions are provided in Appendix 5-1 and in the Glossary

## 5.2 OBJECTIVES

**THE MINISTRY'S GOALS ARE TO:**

- Maintain and restore the ecological diversity of fish and wildlife species and their habitats; and
- Protect the environment and human health and safety by ensuring clean and safe water, land and air.

Environmentally sensitive areas need to be protected from development. Local governments and the development community should meet the following environmental objectives during urban and rural land development:

- Identify environmentally sensitive areas in community and site plans prior to development planning and design;
- Direct development away from environmentally sensitive areas;
- Protect the ecological values of environmentally sensitive areas during and after development;
- Provide buffers and protection measures for environmentally sensitive areas, including the management of recreational access;
- Connect environmentally sensitive areas to nearby habitats using **wildlife corridors**[1];
- Design developments to allow for the continuation of ecological processes that are essential for ecosystem sustainability (flooding, fire, etc.);
- Prevent the spread of **invasive, alien** species in environmentally sensitive areas; and
- Identify and implement restoration opportunities for disturbed environmentally sensitive areas.

Protect ecological values during and after development.
PHOTO: CONSERVATION DATA CENTRE

Local governments should address these issues within their Official Community Plan and other planning and public consultation processes. Developers should be able to demonstrate to local governments and the public how they have addressed these concerns and incorporated them into their development before, during and after the construction process.

## 5.3 LEGAL REQUIREMENTS

Environmentally sensitive areas should be protected from adverse impacts, such as the destruction of birds and their nests as described in the B.C. *Wildlife Act* (s. 34).

Under the federal *Species at Risk Act*, some areas will be designated as **critical habitat** for specified species at risk. The *Species at Risk Act* provides for the protection of these critical habitats.

## 5.4 BEST MANAGEMENT PRACTICES

Best management practices for environmentally sensitive areas focus on protection of these sites before, during and after construction. Best management practices for the protection of these sites at the community or landscape level are provided in Section 3: Environmental Planning at the Community Level. Best management practices for the planning and development of less sensitive sites is provided in Section 4: Environmental Planning and Development at the Site Level.

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[1] Definitions are provided in Appendix 5-1 and in the Glossary

### 5.4.1 Detailed Site Inventory

"The Comox-Strathcona Regional District Sensitive Habitat Atlas incorporates data from the Sensitive Ecosystem Inventory, along with the coastal shoreline and watercourses. The atlas is used as a basis for land use decisions in the Regional District." (http://www.rdcs.bc.ca/environmentalplanning/index.html)

Determine if there are environmentally sensitive areas on or near the proposed development site

☑ Gather available information from community or regional level mapping and inventories. Many local governments have environmental atlases that identify environmentally sensitive areas. Some of these are partial inventories (e.g. wetlands only), while other record many different types of ecosystems (such as the Sensitive Ecosystems Inventories). This information may be available in the Official Community Plan or from the local government office. See Appendix B: Sources for Environmental Mapping and Inventory for sources of information.

☑ Ensure that all environmentally sensitive areas on the site and in adjacent properties are identified.

☑ If the available information is inadequate, have a detailed bio-inventory of the site prepared by an **appropriately qualified professional**. See Section 4.4.2: Detailed Site Inventory, and Appendix C: Terms of Reference for Bio-Inventory.

☑ Provide the results of the bio-inventory to the local government, and any findings of species at risk to the Conservation Data Centre and regional Ministry of Water, Land and Air Protection species at risk staff.

### 5.4.2 Site Planning and Design

Design the development to retain environmentally sensitive areas

☑ Work with an appropriately qualified professional when planning or designing developments near environmentally sensitive areas.

☑ Use information from the mapping and inventories, community environmental plan and the site inventory to support planning and design at the site level.

☑ Ensure that site level planning for protection of identified environmentally sensitive areas meets or exceeds the community level objectives (see Section 3: Environmental Planning at the Community Level).

☑ Locate development away from environmentally sensitive areas. This may mean creating a higher density development on one part of a site, in order to provide for the protection of an environmentally sensitive area on another part of the site.

☑ Avoid or mitigate any impacts your planned development may have on neighbouring environmentally sensitive areas. For example, use stormwater management techniques to avoid impacts on downslope wetlands, waterways, protected nest sites or reptile **hibernacula**.

☑ For developments in coastal areas, see *Coastal Shore Stewardship: A Guide for Planners, Builders and Developers*.

Avoid impacts on neighbouring ecosystems
SUSAN LATIMER

Buffers help to protect the environmentally sensitive area from encroachment by invasive species, impacts from domestic pets, and encroachment by human activities. Make the buffer as wide as possible to protect the environmentally sensitive area.

### CREATE BUFFER AREAS AROUND ENVIRONMENTALLY SENSITIVE AREAS

☑ Establish buffer areas around environmentally sensitive areas. Buffers should be wide enough to protect the ecological integrity of the environmentally sensitive area—both the habitats and the plants and animals living there. Buffers should be on public land where possible, to provide the best long term protection. Where buffers are on private land, they should be protected by a conservation covenant that has enforcement clauses. For suggested buffer widths, see Section 4, Table 4.1.

### LINK ENVIRONMENTALLY SENSITIVE AREAS TO NEARBY GREENSPACES USING WILDLIFE CORRIDORS

☑ Retain pre-existing wildlife corridors by identifying and designing to avoid them (see Section 3: Environmental Planning at the Community Level). This will help maintain biodiversity and reduce wildlife conflicts.

☑ Provide 'green corridors' that facilitate wildlife movement (such as buffers along riparian corridors).

Design trails to minimise impacts
PHOTO: MARGARET HENIGMAN

### DESIGN CAREFULLY FOR RECREATIONAL USE

Often, environmentally sensitive areas are designated as 'park' land, and trails and other recreational facilities may be constructed. Recreational access may damage the features important to the environmentally sensitive area. Some species are not tolerant of human presence and in some cases it could be dangerous, for example if a trail is built next to a hibernaculum for rattlesnakes.

☒ Avoid or minimise trail construction in environmentally sensitive areas. Species such as herons may abandon their nests if trails and disturbances are too close.

☑ Design any trails to avoid fragmentation of the environmentally sensitive area.

☑ Where trails are required, design the trail system to minimise impacts on the environmentally sensitive area, for example by using boardwalks over wet areas, or by placing natural barriers that restrict people to the main trail.

☑ Restrict access to environmentally sensitive areas and buffer areas by people and their pets, for example through the use of **coarse woody debris**, plantings, signs and fencing.

☑ Use signage and other educational tools to inform people about the ecological importance of environmentally sensitive areas.

☑ Recognise the potential for increased invasive species occurrences associated with recreational activities and plan for their effective management.

☑ Refer to *Access Near Aquatic Areas* for information on the design of trails in riparian, wetland or aquatic areas.

☑ See *Best Management Practices for Recreational Activities on Grasslands* for additional information on protecting sensitive grasslands.

Simple cedar split rail fencing can define environmentally sensitive areas and keep dogs out, while allowing small animals to pass through.

### *5.4.3 Protection During Development*

Protection is cheaper than restoration

#### Avoid disturbing the environmentally sensitive area during development

**Protection of existing ecosystems is MUCH cheaper than ecosystem enhancement and restoration. And, in many cases it is not technically possible to restore ecosystems to their original functioning state.**

☑ Identify environmentally sensitive areas and buffers in the field by clearly marking these areas with high visibility protection fencing (such as snow fences or similar material).

☑ Post a site map of environmentally sensitive areas at the entrance to the worksite where workers are sure to see it.

☑ Use informational signage and other means to explain the importance of protection measures and the need to avoid any activity in environmentally sensitive areas, including clearing, disturbing, or storing construction materials in this area.

☑ Schedule construction activities to avoid sensitive periods such as bird nesting. Check timeframes with an appropriately qualified professional.

☑ Maintain snags and woody debris in buffer areas and environmentally sensitive areas to provide habitat for a diversity of wildlife.

☑ Prevent movement of silt laden waters into environmentally sensitive areas by using sediment control techniques (see Section 4.4.8: Erosion and Sediment Control).

☑ Maintain effective fuelling facilities well away from environmentally sensitive areas to prevent contamination (see Section 8.2: Spill Containment and Reporting).

Schedule construction to avoid nesting season
PHOTO: MARK KAARREMAA

### 5.4.4 PROTECTION AFTER DEVELOPMENT

#### Limit access to environmentally sensitive areas

☑ Erect permanent fencing around environmentally sensitive areas to limit access.

#### Use environmentally-friendly landscaping

☑ Use native plants in landscaping. This avoids the use of alien species that might spread into neighbouring environmentally sensitive areas, and leaves less open ground that might be colonised by alien plants. As well, many native plants are adapted to local climates (such as hot, dry summers) and once established, will need less maintenance and watering. For more information see the Naturescape website and Alien Species website.

☑ Encourage local residents to become knowledgeable stewards of environmentally sensitive areas, for example by removing invasive alien species (such as knapweed, Scotch broom or American bullfrogs) before they become well-established. Training courses led by an appropriately qualified professional can assist in the development of effective stewardship groups.

Douglas College's Institute of Urban Ecology in Vancouver has created a "Green Links" program to encourage the linking of fragmented urban habitats through backyards. For more information see http://www.douglas.bc.ca/iue/about.htm

☑ Encourage local residents to use naturescaping techniques such as incorporating nest boxes, bat boxes and other habitat features on their lands. Backyard habitats can provide useful corridors between environmentally sensitive areas for some wildlife.

Garry oak woodland.
Photo: Mark Kaaremma

#### Retain natural ecological processes

Some ecosystems are dependant on natural processes such as frequent or infrequent fires, or flooding.

☑ If the environmentally sensitive area is fire-dependant, plan for frequent controlled burns. **Controlled burns must only be carried out by an appropriately qualified professional.** Frequent controlled burns will not be as hot as wildfires, posing considerably less risk to nearby homes. Controlled burning should be conducted as part of a well planned ecological restoration program within the context of the site being treated.

☑ For flood-dependant ecosystems, see Section 7: Aquatic and Riparian Ecosystems.

### 5.4.5 Restoration of Disturbed Environmentally Sensitive Areas

#### Develop and implement a restoration plan

☑ If an environmentally sensitive area is already disturbed, hire an appropriately qualified professional to prepare a restoration plan.

## 5.5 Useful Sources

*For complete references and a more extensive reading list, see the Bibliography.*

### Legislation:

For a full listing of **provincial government legislation,** see http://www.qp.gov.bc.ca/statreg/list_statreg_1.htm

*B.C. Wildlife Act*: http://www.qp.gov.bc.ca/statreg/stat/W/96488_01.htm

For a full listing of **federal government legislation**, see: http://laws.justice.gc.ca/en/

*Canada Species at Risk Act*: http://www.sararegistry.gc.ca/ (general information) or http://laws.justice.gc.ca/en/S-15.3/index.html (copy of the Act)

### Inventory Information:

Conservation Data Centre: http://srmwww.gov.bc.ca/cdc/index.html

Conservation Data Centre known rare element occurrences: http://srmwww.gov.bc.ca/cdc/access.html

Conservation Data Centre data requests: http://srmwww.gov.bc.ca/cdc/request.html

Conservation Data Centre report of findings: http://srmwww.gov.bc.ca/cdc/contribute.html

Sensitive Ecosystems Inventories (http://srmwww.gov.bc.ca/sei/index.html) are currently available for East Vancouver Island and Gulf Islands; Sunshine Coast; Bowen and Gambier Islands; Central Okanagan; and Bella Vista–Goose Lake Range (North Okanagan).

Sensitive Habitat Inventory and Mapping (part of the Community Mapping Network): http://www.shim.bc.ca/maps2.html

See also Appendix B: Sources for Environmental Mapping and Inventory

### Other Best Management Practices:

These Best Management Practices documents will be posted on the Ministry of Water, Land and Air Protection website (http://wlapwww.gov.bc.ca/wld/BMP/bmpintro.html) in the near future. Some drafts are available for review on other websites. To obtain a copy for review or to comment on these drafts, contact Marlene Caskey (Marlene.Caskey@gems7.gov.bc.ca) or Dr. Grant Bracher (Grant.Bracher@gems2.gov.bc.ca) unless otherwise noted.

*Best Management Practices for Recreational Activities on Grasslands.* For a copy to review, contact Bob Cox, Bob.Cox@gems5.gov.bc.ca

*Best Management Practices for Amphibians and Reptiles in Urban and Rural Environments in British Columbia*: http://www3.telus.net/public/leahmalk/BMP.pdf

To contact regional Ministry of Water, Land and Air Protection offices see http://wlapwww.gov.bc.ca/main/prgs/regions.htm

### Stewardship Publications:

All of the publications in the Stewardship Series are available at http://www.stewardshipcentre.bc.ca/sc_bc/stew_series/bc_stewseries.asp. Titles include:

*Access Near Aquatic Areas; A Guide to Sensitive Planning, Design and Management*

*Coastal Shore Stewardship: A Guide for Planners, Builders and Developers*

*Naturescape: British Columbia: Caring for Wildlife Habitat at Home*

### Restoration and Ecosystems at Risk:

Naturescape website: http://www.hctf.ca/naturescape/about.htm

Alien Species website: http://wlapwww.gov.bc.ca/wld/aliensp/index.html

Institute of Urban Ecology: http://www.douglas.bc.ca/iue/about.htm

B.C. Chapter of the Society for Ecological Restoration: www.serbc.info

Species and Ecosystems at Risk website: http://wlapwww.gov.bc.ca/wld/serisk.htm

## APPENDIX 5-1: DEFINITIONS

See also Glossary

**Alien species:** Plants, animals and micro-organisms from one part of the world that are transported beyond their natural range and become established in a new area. They are sometimes also called "exotic," "introduced," "non-native," or "non-indigenous" species. Some alien species are also **invasive**.

**Appropriately qualified professional:** A scientist or technologist specialising in a relevant applied science or technology including, but not necessarily limited to, agrology, forestry, biology, engineering, geomorphology, geology, hydrology, hydrogeology or landscape architecture, and who is registered in British Columbia with their appropriate professional organisation, and acting under that association's Code of Ethics and subject to disciplinary action by that association, and who, through demonstrated suitable education, experience, accreditation and knowledge relevant to the particular matter, may be reasonably relied on to provide advice within their area of expertise.

**Coarse woody debris:** Sound or rotting logs, stumps or large branches that have fallen or been cut and left in the woods; or trees and branches that have died but remain standing or leaning.

**Critical habitat:** The habitat that is necessary for the survival or recovery of a listed wildlife species and that is identified as the species' critical habitat in the recovery strategy or in an action plan for the species (*Species at Risk Act*, 2(1)).

**Environmentally sensitive area:** A term often used loosely to mean a site or area that has environmental attributes worthy of retention or special care. A more exacting definition is: any parcel of land that already has, or with remedial action could achieve, desirable environmental attributes. These attributes contribute to the retention and/or creation of wildlife habitat, soil stability, water retention or recharge, vegetative cover and similar vital ecological functions. Environmentally sensitive areas range in size from small patches to extensive landscape features. They can include rare or common habitats, plants and animals.

**Hibernaculum (Plural: hibernacula):** Sheltered place where an overwintering animal rests, or a den where snakes hibernate.

**Invasive species:** Plants, animals and micro-organisms that colonise and take over the habitats of native species. Most invasive species are also alien (non-native) to the area, and can become predominant because the natural controls (predators, disease, etc.) that kept populations in check in their native environment are not found in their new location.

**Wildlife corridor:** A travel corridor for wildlife. This ranges from very wide, natural corridors for large mammals, to 'sky corridors' that offer a safe flight path between feeding and resting places for birds, to smaller man-made corridors (such as urban trails) that provide safe passage for smaller creatures. These corridors also provide year-round habitat for less mobile species.

THIS IS PART OF A SERIES OF BEST MANAGEMENT PRACTICES DOCUMENTS

# Environmental Best Management Practices for Urban and Rural Land Development

June 2004

## Section Six

## SPECIAL WILDLIFE & SPECIES AT RISK

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## Summary

The habitats of special wildlife and species at risk need to be protected from development. Best management practices include:

### DETAILED SITE INVENTORY

- Determine if there are special wildlife or species at risk on or near the proposed development site.

### SITE PLANNING AND DESIGN

- Design the development to retain important habitats.
- Create buffers around important habitats.

### PROTECTION DURING DEVELOPMENT

- Avoid disturbing species and important habitats during development.

### PROTECTION AFTER DEVELOPMENT

- Design carefully for recreational use.
- Retain natural ecological processes.
- Minimise invasion by alien species.

### BEST MANAGEMENT PRACTICES FOR SPECIAL WILDLIFE

- Follow identified best management practices for reptiles, amphibians, raptors, Great Blue Heron, sensitive ecosystems and species at risk.

BRITISH COLUMBIA
Ministry of Water, Land and Air Protection
Ecosystem Standards and Planning
Biodiversity Branch

**Extinct:** No longer exists anywhere in the world.
**Extirpated:** No longer exists in the specified area.
**Endangered:** Could become extirpated if limiting factors are not reversed.
**Threatened:** Could become endangered if limiting factors are not reversed.

# Special Wildlife and Species at Risk

**Species at risk**[1] are flora and fauna that are considered nationally and/or provincially at risk. **Special wildlife** includes species that are of particular concern, regionally important species and those governed by the *B.C. Wildlife Act*. 'Species at risk and special wildlife' include plants, plant communities, fungi and invertebrates as well as mammals, birds, reptiles, fish and amphibians.

British Columbia is home to 135 species that are listed nationally by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) as **extirpated, endangered, threatened** or of **special concern.** These species are managed under the Canadian *Species at Risk Act.* **Additional species** will be listed in the next year or two as **provincially-ranked species** are added to the COSEWIC lists.

The Province of British Columbia also maintains a list of species that are considered provincially 'at risk,' including **red-listed species** (that are extirpated, endangered or threatened) and **blue-listed species** (that are not immediately threatened, but are of concern). It also identifies some **yellow-listed species** that are of conservation concern.

Special wildlife and species at risk need particular attention to ensure their continued existence. This section focuses on best management practices to protect and enhance habitats for these species during urban and rural land development. General practices that benefit a variety of wildlife are described in Section 4: Environmental Planning and Development at the Site Level, Section 5: Environmentally Sensitive Areas and Section 7: Aquatic and Riparian Ecosystems. Planning issues focused on wildlife at a community or landscape level are discussed in Section 3: Environmental Planning at the Community Level.

## 6.1 BENEFITS OF SPECIAL WILDLIFE AND SPECIES AT RISK

In addition to the legal requirements to protect special wildlife and species at risk, there are many benefits to doing so. By following some basic guidelines, we can build

### PROTECTING OUR OWN INTERESTS

- **Protecting our health:** Increasingly, we are recognising the medicinal values of many native species. For example: the bark of the Pacific Yew contains a cancer-killing agent; of Canada's 134 native tree species, 38 have one or more recorded medical uses; and frogs provide painkillers and a treatment for schizophrenia (*Canadian Wildlife Service 2004*).
- **Pest control:** If you don't like mosquitoes, make sure you provide homes for the bats and birds that consume millions of the pesky critters. Even slugs have value—consuming detritus and waste materials in the yard.
- **Mental health:** Birds at our birdfeeders, wildflowers on our walks, sightings of wildlife in our community—these enhance the quality of life in our communities and give us pause to refresh our mental health.
- **Big business:** Nature supports big business. In 1996, 2,500,000 British Columbians participated in nature-related activities, spending a total of $1,938 million and creating 34,100 jobs (*Environment Canada 2000*).

For more information, see Appendix A: Benefits of Environmental Protection.

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[1] Definitions are provided in Appendix 6-1 and in the Glossary

communities that respect nature while providing quality places for people to live, work and play, and ensure that the natural legacy persists for future generations to learn from and enjoy.

For more information, see Appendix A: Benefits of Environmental Protection.

## 6.2 OBJECTIVES

**THE MINISTRY'S GOALS ARE TO:**

- Maintain and restore the ecological diversity of fish and wildlife species and their habitats; and
- Protect the environment and human health and safety by ensuring clean and safe water, land and air.

Local governments and the development community should meet the following environmental objectives during urban and rural land development:

- Identify populations of special wildlife and species at risk and their habitats **prior to** development planning;
- Direct development away from habitats that support special wildlife and species at risk;
- Provide and maintain adequate buffers to protect these species and their habitats; and
- Protect, and where needed restore, the habitats that support special wildlife and species at risk.

Local governments should address these issues within their Official Community Plan and other planning and public consultation processes. Developers should be able to demonstrate to local governments and the public how they have addressed these concerns and incorporated them into their development before, during and after the construction process.

## 6.3 LEGAL REQUIREMENTS

Special wildlife and species at risk, and the habitats and ecosystems that sustain them, must be protected from harm.

The Canadian *Species at Risk Act* makes it an offence to kill or harm listed species at risk or damage their habitat on federal lands. Recovery Strategies and Recovery Action Plans have been or are being developed for all listed species at risk. The *Species at Risk Act* also consolidates requirements under the *Canada Wildlife Act*, the *Migratory Bird Convention Act*, and the Wild Animal and Plant Regulations of the *International and Interprovincial Trade Act* for the protection of special wildlife and species at risk.

The Province of British Columbia is currently developing legislation to manage species at risk on private land and provincial Crown land in British Columbia.

The British Columbia *Wildlife Act* protects most vertebrate animals from direct harm or harassment except as allowed by regulation (e.g. hunting or trapping). Legal designation provides additional protection for selected red- and blue-listed species and their residences. Legal designation as Endangered or Threatened species under the Act

Osprey nest.
PHOTO: DAVE POLSTER

increases the penalties for harming a species, and also enables the protection of habitat in a Wildlife Management Area.

Section 34 of the B.C. ***Wildlife Act*** specifically protects the nests of eagles, peregrine falcons, gyrfalcons, osprey, herons and burrowing owls year-round; and the nests of all other birds when these birds or their eggs are in the nest.

## 6.4 BEST MANAGEMENT PRACTICES

The following best management practices cover the identification and protection of special wildlife and species at risk. Additional best management practices have also been developed for specific species or types of wildlife.

### *6.4.1 Detailed Site Inventory*

#### DETERMINE IF THERE ARE SPECIAL WILDLIFE OR SPECIES AT RISK ON OR NEAR THE PROPOSED DEVELOPMENT SITE

- ☑ Gather available information from community or regional level mapping and inventories (see Appendix B: Sources for Environmental Mapping and Inventory and Section 4.4.2: Detailed Site Inventory). The Conservation Data Centre (CDC) can provide information on known locations of species at risk. Note that coverage by the CDC is not equally good in all areas so be aware that a lack of CDC listing does not mean the species is not found in that location.
- ☑ Review information on terrestrial and aquatic environmentally sensitive areas on or near the development site to determine if additional measures are needed to protect specific habitat requirements and concerns for special wildlife and species at risk. For more information, see Section 5: Environmentally Sensitive Areas and Section 7: Aquatic and Riparian Ecosystems.
- ☑ If the available information is inadequate, have a detailed bio-inventory of the site prepared by an **appropriately qualified professional**. See Section 4.4.2: Detailed Site Inventory, and Appendix C: Terms of Reference for Bio-Inventory. Note that the timing of the bio-inventory is important, as some species may only be visible or may only use the area at certain times of year. In some cases it may be necessary to inventory the site in more than one season to fully assess its ecological values.
- ☑ Provide the results of the bio-inventory to the local government, and any findings of species at risk to the Conservation Data Centre and regional Ministry of Water, Land and Air Protection Rare and Endangered Species Biologists.
- ☑ Ensure that the developer's proposal package to the local government (report and mapping) identifies critical wildlife habitats, wildlife corridors, the presence (or likelihood of presence) of any species at risk or special wildlife, recommended buffers around the site, and links to other wildlife habitats with reference to both the landscape- and the site-level features.

For more information on B.C.'s species and ecosystems, see the B.C. Species Explorer website http://srmwww.gov.bc.ca/atrisk/toolintro.html

All too often, 'Deer Woods' subdivision or 'Eagle Lane' are named for the species that were found before subdivision. Make your development stand out by retaining natural habitat features and promoting the continued existence of these species.

### 6.4.2 Site Planning and Design

DESIGN THE DEVELOPMENT TO RETAIN IMPORTANT HABITATS

☑ Work with an appropriately qualified professional to plan developments near habitats of special wildlife and species at risk, including areas with red- or blue-listed plant communities.

☑ Follow the prescribed best management practices for special wildlife and species at risk (see Section 6.4.5: Best Management Practices for Specific Wildlife). For species at risk, check with the SARA Registry and regional Ministry of Water, Land and Air Protection Rare and Endangered Species Biologists to see if recovery action plans are available for the species in question.

☒ Do not site developments (including trails) in areas known to be important habitat for special wildlife or species at risk, nor immediately adjacent to these areas.

☑ Encourage the presence of special wildlife and species at risk by incorporating habitat features (e.g. wetlands) into development plans. These features may enhance property values, and improve the quality of life and pride of ownership by area residents. See Appendix A: Benefits of Environmental Protection.

☑ Retain species-appropriate **wildlife corridors** through and around the development.

CREATE BUFFERS AROUND IMPORTANT HABITATS

☑ Design buffer areas around important habitats. These should be sufficiently wide to protect the ecosystems and the species living there. Appropriately qualified professionals can provide guidance on the width and design of buffers required to protect these habitats. Buffers should be on public land where possible, to provide the best long term protection. Where buffers are on private land, they should be protected by a conservation covenant or other legal mechanism, with enforcement mechanisms. For a discussion on buffers and protective measures see Section 4.4.3: Retain buffers around sensitive areas.

☑ For information on suggested buffer widths for some species or groups of species, see Section 4, Table 4.1.

### 6.4.3 Protection During Development

AVOID DISTURBING SPECIES AND IMPORTANT HABITATS DURING DEVELOPMENT

☑ Clearly delineate and fence off important habitats and buffers areas on the site prior to starting work and inform site workers of their importance, as discussed in Section 5.4.3: Protection During Development.

☑ Schedule construction activities to avoid sensitive periods such as nesting, spawning, hibernating, migration etc. The Ministry's regional websites provide some information on timing windows, and an appropriately qualified professional can provide site-specific advice. The Ministry of Water, Land and Air Protection is currently developing a Timing Windows Best Management Practices document, and this will be posted on the Ministry's Best Management Practices website when available. Timing windows for instream works are discussed in *Standards and Best Practices for Instream Works*.

### 6.4.4 PROTECTION AFTER DEVELOPMENT

Yellow montane violet is red-listed in British Columbia.
PHOTO: DAVE POLSTER

#### DESIGN CAREFULLY FOR RECREATIONAL USE

Recreational activities may disturb wildlife.

☒ Avoid or minimise trail construction near sensitive wildlife habitats. Species such as herons may abandon their nests if trails and disturbances are too close.

☑ Locate trails away from areas where 'at-risk' plants grow. This will minimise concerns about people picking the flowers or inadvertently trampling the site.

☑ Require that dogs be leashed in sensitive habitats to prevent them chasing birds or other wildlife, or trampling sensitive plants.

☑ For more information on designing trails near sensitive features, see *Access Near Aquatic Areas: A Guide to Sensitive Planning, Design, and Management* and *Best Management Practices for Recreational Activities on Grasslands.*

We often don't appreciate native species until they are gone. In 1970, foresters in New Brunswick used a chemical control for spruce budworm. It turned out this chemical was highly toxic to wild bees, and without natural pollinators, the local commercial blueberry crop was reduced by 665 tonnes (*Kingsmill 1993*).

#### RETAIN NATURAL ECOLOGICAL PROCESSES

Ecosystems, and the special wildlife and/or species at risk that live in them, may be dependant on natural processes such as nutrient cycling, frequent or infrequent fires, or flooding.

☑ Ensure that the natural (pre-development) hydrological cycles are maintained during and after development. Changes in drainage patterns may impact wildlife, for example by putting year-round water into an area where species are adapted to summer droughts or by changing the quality of the water.

☑ Consider (where applicable) the development of plans that include low-intensity ground fires. Many of the species at risk or special wildlife that inhabit these ecosystems need the old, open stands that were common to parts of British Columbia prior to current fire management regimes. **Controlled burns must only be carried out by an appropriately qualified professional.**

☑ Build well away from floodplains and allow natural flooding cycles to occur so that flood-dependant ecosystems can persist. Some species at risk and special wildlife species depend on the ecosystems that develop in response to natural flooding.

#### MINIMISE INVASION BY ALIEN SPECIES

Invasive alien species significantly change and disrupt the habitat of special wildlife and species at risk. By replacing native plants that provide food and shelter for the species at risk, or taking over its habitat, they endanger its existence. For more information on alien species and their management, see the Alien Species website.

- ☑ Use only species native to the area in landscaping. As these plants are adapted to local ecological conditions, they usually require less maintenance once established and are therefore less expensive in the long term. For information on plants suitable for the Georgia Basin and Southern Interior of British Columbia, see the Naturescape website.
- ☑ Encourage local residents to become stewards of their area, for example helping to remove alien species (both plants and animals) before they become well-established.

### 6.4.5 Best Management Practices for Specific Wildlife

The following best management practices have been developed to address the specific requirements of selected species. Future versions of this document will have sections on regionally important species (such as Yellow Breasted Chat).

#### BEST MANAGEMENT PRACTICES FOR AMPHIBIANS AND REPTILES

Amphibians and reptiles play important roles in the ecosystem both as predators and prey, and consume many species that humans consider 'pests,' such as insects and rodents. Many reptiles and amphibians found in prime urban and rural development areas as are decreasing in number and are already identified as species at risk. However, many species are compatible with urban and rural environments if critical habitat components are maintained.

The objective for amphibians and reptiles is to avoid or minimise habitat loss and maintain viability of their populations. Maintaining pre-development hydrology is particularly critical. For more information see *Best Management Practices for Amphibians and Reptiles in Urban and Rural Environments in British Columbia*.

#### BEST MANAGEMENT PRACTICES FOR RAPTORS

Raptors are birds of prey and include falcons, hawks, ospreys, owls and eagles. Healthy raptor populations help to maintain a balance in populations of prey species (e.g. rodents and starlings).

The objective for raptors is to maintain their population through habitat protection, including their hunting (food source) and nesting areas. For more information see *Best Management Practices Guidebook for Raptors in British Columbia: Guidelines for Integrating Raptor Conservation with Urban and Rural Land Developments.*

#### BEST MANAGEMENT PRACTICES FOR GREAT BLUE HERON

Great Blue Herons are large birds of shorelines, wetlands and sloughs as well as some upland areas. Great Blue Heron nest trees are protected (whether or not in use) by Section 34 of the *B.C. Wildlife Act.*

Heron nests.
PHOTO: TODD CASHIN

The objective for Great Blue Heron is to retain feeding and nesting habitat. Nesting rookeries are of particular importance as these may serve the heron population over a wide area. Herons are particularly vulnerable to disturbance during their nesting season and have been known to desert a colony when disturbed. Use the buffers presented in Table 4-1 as a guide for protection of habitat for Great Blue Heron.

For more information on Great Blue Herons, see the Heron Working Group website.

### BEST MANAGEMENT PRACTICES FOR SENSITIVE ECOSYSTEMS

Sensitive ecosystems frequently contain plants and animals at risk, and many of these ecosystems are themselves red-listed plant communities.

Grasslands and interior wetlands are sensitive ecosystems.
PHOTO: SUSAN LATIMER

Sensitive Ecosystems Inventories have been completed for East Vancouver Island and Gulf Islands; Sunshine Coast; Bowen and Gambier Islands; Central Okanagan; and Bella Vista–Goose Lake Range (North Okanagan). For guidelines on the management of these sensitive ecosystems, see the Sensitive Ecosystems Inventory (East Vancouver Island and Gulf Islands) *Conservation Manual* or the Sensitive Ecosystems Inventory (Central Okanagan) *Technical Report*. (The Technical Report for the Sunshine Coast Sensitive Ecosystems Inventory is under development.)

### BEST MANAGEMENT PRACTICES FOR SPECIES AT RISK

The federal government and Recovery Teams are working on the development of Recovery Strategies and Recovery Action Plans for all federally-listed species at risk. These Recovery Action Plans include guidelines and requirements for the protection of these species. For more information see the *Species at Risk Act* Public Registry.

There are also provincial recovery plans for some species. For more information on federal and provincial programs see Recovery Planning in British Columbia.

Some recovery plans cover entire ecosystems that are home to multiple species at risk. For more information see the Garry Oak Ecosystem Recovery Team and South Okanagan-Similkameen Conservation Program.

**RECOVERY PLANNING**

"A **recovery strategy** outlines the long term goals and short term objectives for recovering a species at risk. This includes information on what is known about the species, what we need to learn, the threats to its survival, and an identification of its critical habitat.

An **action plan** outlines the projects or activities required to meet the goals and objectives outlined in the recovery strategy. This includes information on the species habitat, protection measures, and an evaluation of the socio-economic costs and benefits."

*SARA Registry* http://www.sararegistry.gc.ca/plans/recovery_e.cfm

## 6.5 USEFUL SOURCES

*For complete references and a more extensive reading list, see the Bibliography.*

**LEGISLATION:**

For a full listing of **provincial government legislation**, see http://www.qp.gov.bc.ca/statreg/list_statreg_1.htm

B.C. *Wildlife Act*: http://www.qp.gov.bc.ca/statreg/stat/W/96488_01.htm

For a full listing of **federal government legislation**, see: http://laws.justice.gc.ca/en/

Canada *Species at Risk Act*: http://www.sararegistry.gc.ca/ (general information) or http://laws.justice.gc.ca/en/S-15.3/index.html (copy of the Act)

Canada *Wildlife Act:* http://laws.justice.gc.ca/en/W-9/index.html

Canada *Migratory Bird Convention Act*: http://laws.justice.gc.ca/en/M-7.01/index.html

Wild Animal and Plant Regulations of the *International and Interprovincial Trade Act* http://laws.justice.gc.ca/en/W-8.5/index.html

**INVENTORY INFORMATION:**

Conservation Data Centre: http://srmwww.gov.bc.ca/cdc/index.html

Conservation Data Centre known occurrences: http://srmwww.gov.bc.ca/cdc/access.html

Conservation Data Centre data requests: http://srmwww.gov.bc.ca/cdc/request.html

Conservation Data Centre report of findings: http://srmwww.gov.bc.ca/cdc/contribute.html

B.C. Species Explorer: http://srmwww.gov.bc.ca/atrisk/toolintro.html

Sensitive Ecosystems Inventories (http://srmwww.gov.bc.ca/sei/index.html) are currently available for East Vancouver Island and Gulf Islands; Sunshine Coast; Bowen and Gambier Islands; Central Okanagan; and Bella Vista–Goose Lake Range (North Okanagan).

**OTHER BEST MANAGEMENT PRACTICES:**

These Best Management Practices documents will be posted on the Ministry of Water, Land and Air Protection website (http://wlapwww.gov.bc.ca/wld/BMP/bmpintro.html) in the near future. Some drafts are available for review on other websites. To obtain a copy for review or to comment on these drafts, contact Marlene Caskey (Marlene.Caskey@gems7.gov.bc.ca) or Dr. Grant Bracher (Grant.Bracher@gems2.gov.bc.ca) unless otherwise noted.

*Best Management Practices for Recreational Activities on Grasslands*. For a copy to review, contact Bob Cox, Bob.Cox@gems5.gov.bc.ca

*Best Management Practices for Amphibians and Reptiles in Urban and Rural Environments in British Columbia*: http://www3.telus.net/public/leahmalk/BMP.pdf

*Best Management Practices Guidebook for Raptors in British Columbia: Guidelines for Integrating Raptor Conservation with Urban and Rural Land Developments*

*Standards and Best Practices for Instream Works:* http://wlapwww.gov.bc.ca/sry/iswstdsbpsmarch2004.pdf

To contact regional Ministry of Water, Land and Air Protection offices see
http://wlapwww.gov.bc.ca/main/prgs/regions.htm

### SPECIES AND ECOSYSTEMS AT RISK AND RECOVERY:

B.C. Species Explorer: http://srmwww.gov.bc.ca/atrisk/toolintro.html (British Columbia's species at risk)

Committee on the Status of Endangered Wildlife in Canada (COSEWIC):
http://www.cosewic.gc.ca/eng/sct5/index_e.cfm (Canadian species at risk)

Endangered Species and Ecosystems website: http://srmwww.gov.bc.ca/atrisk/

Garry Oak Ecosystem Recovery Team: http://www.goert.ca/

Heron Working Group: http://www.heronworkinggroup.org/abouthwg.html

Recovery Planning in British Columbia website:
http://wlapwww.gov.bc.ca/wld/recoveryplans/rcvry1.htm

South Okanagan-Similkameen Conservation Program: http://www.soscp.org/

Species and Ecosystems at Risk website: http://wlapwww.gov.bc.ca/wld/serisk.htm

### SENSITIVE ECOSYSTEMS

Sensitive Ecosystems Inventory website: http://srmwww.gov.bc.ca/sei/

Sensitive Ecosystems Inventory (East Vancouver Island and Gulf Islands) Conservation Manual:
http://srmwww.gov.bc.ca/sei/van_gulf/doc/SEICMfinal.pdf

Sensitive Ecosystems Inventory (Central Okanagan) Technical Report:
ftp://ftp.env.gov.bc.ca/dist/wis/tem/warehouse/region_3/central_okanagan/reports/cok_rpt.pdf

### NATURESCAPE

Naturescape British Columbia: http://wlapwww.gov.bc.ca/hctf/naturescape/about.htm

### ALIEN SPECIES

Alien species website: http://wlapwww.gov.bc.ca/wld/aliensp/index.html

### STEWARDSHIP PUBLICATIONS:

All of the publications in the Stewardship Series are available at
http://www.stewardshipcentre.bc.ca/sc_bc/stew_series/bc_stewseries.asp. Titles include:

*Access Near Aquatic Areas; A Guide to Sensitive Planning, Design and Management*

## APPENDIX 6-1: DEFINITIONS

See also Glossary

Alien species: Plants, animals and micro-organisms from one part of the world that are transported beyond their natural range and become established in a new area. They are sometimes also called "exotic," "introduced," "non-native," or "non-indigenous" species. Some alien species are also **invasive**.

Appropriately qualified professional: A scientist or technologist specialising in a relevant applied science or technology including, but not necessarily limited to, agrology, forestry, biology, engineering, geomorphology, geology, hydrology, hydrogeology or landscape architecture, and who is registered in British Columbia with their appropriate professional organisation, and acting under that association's Code of Ethics and subject to disciplinary action by that association, and who, through demonstrated suitable education, experience, accreditation and knowledge relevant to the particular matter, may be reasonably relied on to provide advice within their area of expertise.

Blue-listed species: Includes any native species, subspecies or community considered to be Vulnerable (Special Concern) in British Columbia. Vulnerable species are of special concern because of characteristics that make them particularly sensitive to human activities or natural events. Blue-listed species are at risk, but are not Extirpated, Endangered or Threatened.

Endangered: A species facing imminent extirpation or extinction.

Extinct: A species that no longer exists anywhere in the world.

Extirpated: A species no longer existing in the wild in Canada, but occurring elsewhere. (A species listed as provincially extirpated no longer exists in the wild in British Columbia, but occurs in other parts of Canada or elsewhere.)

Invasive species: Plants, animals and micro-organisms that colonise and take over the habitats of native species. Most invasive species are also alien (non-native) to the area, and can become predominant because the natural controls (predators, disease, etc.) that kept populations in check in their native environment are not found in their new location.

Plant community: A unit of vegetation with a relatively uniform species composition and physical structure. Plant communities also tend to have characteristic environmental features such as bedrock geology, soil type, topographic position, climate, and energy, nutrient and water cycles.

Red-listed species: Includes any indigenous species, subspecies or plant community that is Extirpated, Endangered, or Threatened in British Columbia. Extirpated species no longer exist in the wild in British Columbia, but do occur elsewhere. Endangered species are facing imminent extirpation or extinction. Threatened species are likely to become endangered if limiting factors are not reversed.

Special concern: A species that is particularly sensitive to human activities or natural events but is not an endangered or threatened species.

Special wildlife: Wildlife species that have been identified in the British Columbia *Wildlife Act*, or that have been identified by Ministry of Water, Land and Air Protection as being of regional concern. See also **red-listed** and **blue-listed** species.

Species at risk: A species that has been defined as 'at risk' by either the federal or provincial government.

- Federally listed: The federal Committee on the Status of Endangered Wildlife in Canada (COSEWIC) maintains a list of species listed as extirpated, endangered, threatened or of special concern. These species are protected under the *Species at Risk Act.*
- Provincially ranked: The British Columbia government maintains a ranking of species considered to be "red-listed" and "blue-listed" in this province.

Threatened: A species likely to become endangered if limiting factors are not reversed.

Wildlife corridors: A travel corridor for wildlife. These range from very wide, natural corridors for large mammals, to 'sky corridors' that offer a safe flight path between feeding and resting places for birds, to smaller man-made corridors (such as urban trails or culverts under roads) that provide safe passage for smaller creatures. These corridors also provide year-round habitat for less mobile species.

Wildlife Management Area: Land that has been designated as a wildlife management area under the B.C. *Wildlife Act.*

Wildlife trees: A standing live or dead tree with special characteristics that provide valuable habitat for the conservation or enhancement of wildlife. Characteristics include large diameter and height for the site, current use by wildlife, declining or dead condition, value as a species, valuable location and relative scarcity.

Yellow-listed species: All species not included on the British Columbia Red or Blue lists. Some of these yellow-listed species are considered to be of conservation concern because they have a small range or low abundance in the province, because they have shown provincial declines, or there are perceived long-term threats.

THIS IS PART OF A SERIES OF BEST MANAGEMENT PRACTICES DOCUMENTS

# Environmental Best Management Practices for Urban and Rural Land Development

Sensitive Fish Habitat
This stream supports spawning and rearing Kokanee salmon year round.
Please help protect it.
7

June 2004

## Section Seven

## AQUATIC AND RIPARIAN ECOSYSTEMS

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BRITISH COLUMBIA
Ministry of Water, Land and Air Protection
Ecosystem Standards and Planning
Biodiversity Branch

## Summary

Best management practices for the protection and enhancement of aquatic and riparian ecosystems during land development include:

### DETAILED SITE INVENTORY

- Identify all aquatic and riparian ecosystem on or near the proposed development site

### SITE PLANNING AND DESIGN

- Retain wide riparian protection areas
- Design the development to protect aquatic and riparian features and functions
- Manage stormwater carefully

### PROTECTION DURING DEVELOPMENT

- Consult the Instream Works Best Management Practices guide
- Protect riparian vegetation during construction
- Protect water quality during construction
- Avoid water level fluctuations in amphibian habitat
- Daylight culverted streams where possible

### PROTECTION AFTER DEVELOPMENT

- Protect riparian vegetation after development
- Protect water quality and quantity after development

### RESTORATION AND ENHANCEMENT

- Restore and enhance damaged aquatic and riparian ecosystems

### HUMAN ACCESS TO AQUATIC AND RIPARIAN ECOSYSTEMS

- Control access to aquatic and riparian ecosystems

### ECOSYSTEM-SPECIFIC BEST MANAGEMENT PRACTICES

- Protect wetlands, vernal pools, lakeshores and marine sensitive zones

# Aquatic and Riparian Ecosystems

**Aquatic ecosystems**[1] are 'wet' ecosystems such as watercourses, lakes, ponds, **vernal pools** and **wetlands**. Some of these ecosystems may be dry during the summer months or frozen in the winter. **Riparian ecosystems** are the areas beside these aquatic ecosystems, supporting vegetation that can tolerate damper conditions and occasional flooding. Riparian ecosystems also occur in wet or dry gullies. Both aquatic and riparian ecosystems are extremely biologically diverse and productive. **Marine sensitive zones** (**estuaries** and their foreshore areas) are also important for biodiversity.

In many urban and suburban areas the remaining aquatic and riparian ecosystems play a critical role in helping to maintain biodiversity as they provide habitat and **wildlife corridors** for many terrestrial and aquatic species.

Aquatic and riparian areas are often home to special wildlife and species at risk. See Section 6: Special Wildlife and Species at Risk for further information on best management practices for these species.

## 7.1 BENEFITS OF HEALTHY AQUATIC AND RIPARIAN ECOSYSTEMS

Aquatic and riparian ecosystems are a vital part of our communities, providing a source of water, viewscapes and home for a wide variety of aquatic and terrestrial species.

For more information, see Appendix A: Benefits of Environmental Protection.

### BENEFITS OF AQUATIC AND RIPARIAN ECOSYSTEMS

- **A multi-million dollar industry:** 500,000 licensed and juvenile anglers spend about $500 million each year on freshwater sport fishing (*Bridges 2002*).
- **Increased property values:** Properties next to healthy aquatic and riparian areas sell quickly and for higher prices (*Quayle and Hamilton 1999*).
- **Flood and erosion protection:** Riparian areas slow and soak up floodwaters, and the roots of vegetation strengthen the stream banks to reduce erosion.
- **Stormwater management:** Natural riparian vegetation along streams and wetlands can dramatically reduce the need for expensive storm sewer infrastructure (*Habitat Acquisition Trust 2004*).
- **Drinking water supply:** Watercourses are an important water supply for many communities. Even where the stream is not directly used as a drinking water source, aquatic and riparian areas provide a significant source of groundwater recharge, especially in urbanised areas where much of the watershed is paved over, and stormwater is piped directly to the stream. Groundwater recharge is important for communities that rely on wells, and helps to maintain stream flows for surface water extraction.
- **Pollution filtration:** Wetlands and streamside vegetation act as water filters that clean pollutants from the water before they reach our creeks and streams
- **Wildlife havens:** Many species at risk—including insects, amphibians, reptiles, birds and mammals as well as fish—rely on aquatic and riparian habitats for at least part of their life cycle.

For more information, see Appendix A: Benefits of Environmental Protection.

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[1] Definitions are provided in Appendix 7-1 and in the Glossary

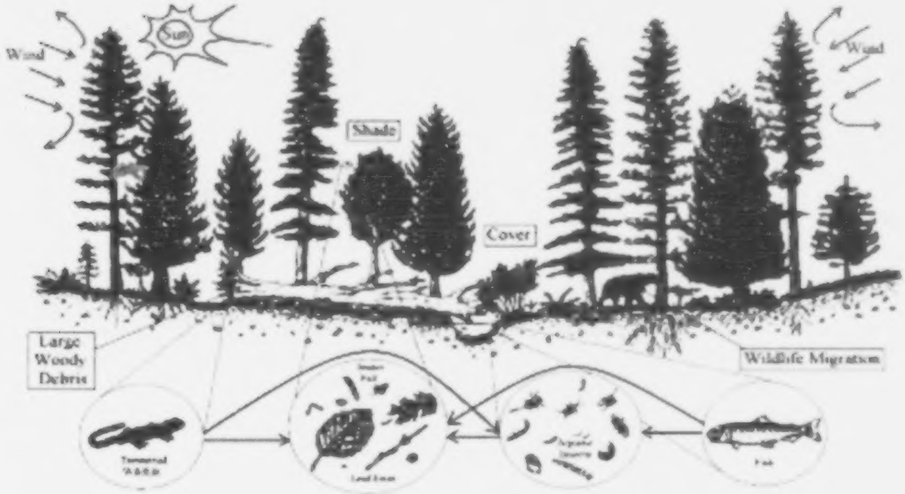


**Figure 1:** Ways in which healthy riparian areas help to ensure healthy fish populations
(Ministry of Water, Land and Air Protection)

## 7.2 OBJECTIVES

Aquatic and riparian ecosystems need to be protected from development. Local governments and the development community should meet the following environmental objectives during urban and rural land development:

- Identify all aquatic and riparian values, **features** and **functions**[1] prior to any development;
- Protect, restore and enhance the **ecological integrity** of aquatic and riparian ecosystems, including the natural ecosystem features and functions;
- Protect the water quality and quantity in aquatic ecosystems;
- Maintain, restore or enhance aquatic and riparian ecosystems as wildlife corridors through urban and rural areas, including connections to terrestrial habitats.

Local governments should address these issues within their Official Community Plan and other planning and public consultation processes. Developers should be able to demonstrate to local governments and the public how they have addressed these concerns and incorporated them into their development before, during and after the construction process.

## 7.3 LEGAL REQUIREMENTS

Land development around aquatic and riparian ecosystems are governed by the following legislation and regulations;

- The Canada *Fisheries Act* (Section 35 (1)) notes that "...no person shall carry on work or undertaking that results in the harmful alteration, disruption or destruction of fish

[1] See Appendix 7-2: Ecological Features and Functions of Aquatic and Riparian Ecosystems

habitat." Two elements of this legislation must be met before Fisheries and Oceans Canada or Ministry of Water, Land and Air Protection will pursue a charge against a landowner:

- The site must be fish habitat
- The habitat must be harmfully altered, disrupted or destroyed. Fish habitat as defined by the *Fisheries Act* includes any area which sustains a fish life cycle either directly or indirectly. This may include: spawning areas; feeding areas for any stage of the life cycle; living/holding areas; fish food producing areas where food can form part of the life cycle, even if fish are not present; and migration routes.

Streamside Protection Regulations: At the time of writing (May 2004), the provincial government is reviewing the Streamside Protection Regulations that govern riparian setbacks. For more information, see http://wlapwww.gov.bc.ca

The importance of streamside/riparian vegetation as fish habitat has been successfully brought before the courts, and legal judgements have identified riparian vegetation as fish habitat. For more information see http://www-heb.pac.dfo-mpo.gc.ca/habitat_policy/charges_e.htm.

- The B.C. *Fish Protection Act* designates sensitive streams for fish sustainability, and provides for the development of recovery plans for these streams. It also includes provision for riparian setbacks in the Streamside Protection Regulations.
- The Streamside Protection Regulations of the Fish Protection Act are currently under review. Updated information will be posted on the Ministry website when new regulations are in place.
- The B.C. *Water Act*, Part 7 'changes in and about a stream' regulation (Water Act Regulation 204/88) allow persons to carry our specified activities in and about streams (such as installation of culverts, clear span bridges and pipeline crossings) without the need to obtain a formal approval under the *Water Act*, so long as the activity is carried out in compliance with the regulation. Applications are available at http://wlapwww.gov.bc.ca/vir/es/instream.html.

## 7.4 BEST MANAGEMENT PRACTICES

Best management practices for aquatic and riparian ecosystems centre on protection of these ecosystems from adverse impacts associated with the conversion of the natural landscape to urban/rural land uses. Opportunities may exist to restore or enhance aquatic and riparian ecosystems during the process of developing adjacent lands.

These best management practices apply to all types of riparian areas. For additional ecosystem-specific guidelines see Section 7.4.7: Ecosystem-Specific Best Management Practices.

For additional information on best management practices that benefit aquatic and riparian ecosystems and can result in savings to a development project, refer to the sections on Stormwater Management and Erosion and Sediment Control in Section 3: Environmental Planning at a Community Level and Section 4: Environmental Planning and Development at the Site Level.

### 7.4.1 Detailed Site Inventory

IDENTIFY ALL AQUATIC AND RIPARIAN ECOSYSTEMS ON OR NEAR THE PROPOSED DEVELOPMENT SITE

Identify aquatic and riparian ecosystems.
PHOTO: SUSAN LATIMER

☑ Gather available information from community or regional level mapping and inventories (see Appendix B: Sources for Environmental Mapping and Inventory and Section 4.4.2: Detailed Site Inventory). Other useful sources include the Fish Wizard, the Sensitive Habitat Inventory and Mapping (SHIM), the B.C. Wetlands Atlas, Fisheries Inventory Summary System (FISS), South Coast Cutthroat Atlas and Eelgrass Bed Mapping Atlas. The Conservation Data Centre (CDC) can provide information on known locations of species at risk. Note that coverage by the CDC is not equally good in all areas so be aware that a lack of CDC listing does not mean that species at risk are not found in that location. If the available information is inadequate, have a detailed bio-inventory of the site prepared by an appropriately qualified professional. See Section 4.4.2: Detailed Site Inventory, and Appendix C: Terms of Reference for Bio-Inventory. Note that the timing of the bio-inventory is important, as some species may only be visible or may only use the area at certain times of year. In some cases it may be necessary to inventory the site in more than one season to fully assess its ecological values.

☑ Ensure that the report identifies the ecosystem features and functions of aquatic and riparian ecosystems, site hydrology, and recommended riparian buffers as well as links to terrestrial information.

☑ Gather baseline data on pre-development hydrological conditions.

☑ Provide the results of the bio-inventory to the local government, and any findings of species at risk to the Conservation Data Centre and regional Ministry of Water, Land and Air Protection species at risk staff.

### 7.4.2 Site Planning and Design

RETAIN WIDE AREAS

The best available science around establishment of effective riparian buffers continues to evolve. Most earlier studies focused on requirements for various life stages. However, in recent years more effort is being placed on the riparian requirements of other species such as amphibians and birds. The use of this best available science also continues to evolve. In Washington State application of new science is altering the riparian buffers in a number of counties. Site specific habitat management plans may reduce the buffers by 50% where an appropriately qualified professional determines there will be no net loss of functions or values. This approach is similar to the Riparian Area Regulation soon to come into effect in British Columbia. Specific details of some of the proposed changes to county critical areas ordinances and updates to best available science can be found at www.kitsapgov.com/dcd/cao and http://wwwecy.wa.gov.programs.sea/wetlan.html .

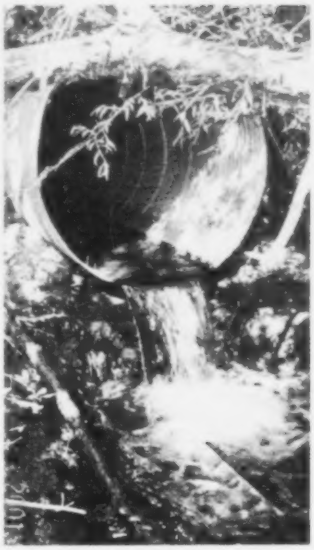
Many local governments have defined these setbacks in Development Permit Areas and Zoning Bylaws. Note that these setbacks are primarily designed to protect aquatic species and may not be sufficient to retain other sensitive species such as amphibians and birds. Advice from an appropriately qualified professional can provide direction on appropriate width for the **riparian protection area**.

☑ Establish effective riparian buffers at an early stage in site planning.

☑ Ensure riparian buffer areas meet the needs of terrestrial as well as aquatic species that use these areas.

☑ Take advantage of opportunities to re-create and widen riparian buffer areas during land re-development.

☑ Recognise that fire-proofing plans may suggest removal of shrubby vegetation in riparian areas—design the development to keep dwellings well away from these areas to avoid having to remove vegetation.



This perched culvert is a barrier to fish passage

T. CASHIN PHOTO

### DESIGN THE DEVELOPMENT TO PROTECT AQUATIC AND RIPARIAN FEATURES AND FUNCTIONS

☒ Do not develop in the riparian protection area. This may involve increasing density on a less sensitive part of the site in order to protect riparian ecosystems.

☒ Avoid or minimise stream crossings.

☑ Where stream crossings are required, ensure that they continue to provide passage for fish and wildlife, and that that they are located where there will be least impact to the stream and riparian vegetation.

☑ Place utility crossings at stream crossing locations and use directional drilling where possible to minimise disturbances to riparian vegetation. For more information refer to the *Fish-stream Crossing Guidebook*.

☒ Do not create lots that straddle the watercourse and riparian zone. This would increase the number of stream crossings and likely damage the riparian protection area as owners access the different parts of their property.

☑ Consult local government bylaws and permitting processes to identify additional local restrictions and requirements.

☑ For more information see *Stream Stewardship: A Guide for Planners and Developers* and *Land Development Guidelines for the Protection of Aquatic Habitat*.

### MANAGE STORMWATER CAREFULLY

☒ Avoid changes to natural drainage patterns. Changes in overground or underground flow patterns can destabilise banks and impact on aquatic habitats.

☒ Do not use local streams or wetlands for unmanaged stormwater discharge. The increased flows can significantly increase erosion and damage wildlife habitats.

The Water Balance Model promotes a watershed-based approach that manages the natural environment and the built environment as integrated components of the same watershed. http://www.waterbalance.ca/sql/home/index.asp

☑ For more information see *Stormwater Planning: A Guidebook for British Columbia* (Chapters 6 and 7) and the Water Balance Model.

### 7.4.3 Protection During Development

CONSULT THE INSTREAM WORKS BEST MANAGEMENT PRACTICES GUIDE

☑ For all work in and around watercourses, follow the guidelines of the *Standards and Best Practices for Instream Works* and any other regional best management practices[2].

☑ Follow prescribed timing windows for construction in and around watercourses. The Ministry's regional websites provide some information on timing windows, and an appropriately qualified professional can provide site-specific advice. The Ministry of Water, Land and Air Protection is currently developing a Timing Windows Best Management Practices document, and this will be posted on the Ministry's Best Management Practices website when available. Timing windows for instream works are also discussed in *Standards and Best Practices for Instream Works*.

PROTECT RIPARIAN VEGETATION DURING CONSTRUCTION

☑ Use the services of an appropriately qualified environmental monitor to undertake authorised work within aquatic and riparian ecosystems. Use of an environmental monitor can result in considerable cost and time savings and reduced liability, as it helps to ensure that regulatory requirements are met, and minimises the possibility that remedial work might be required. Many local governments require environmental monitors to be on site for such work as well as requiring development permits specific to the riparian area.

☑ Carefully survey, sign and clearly mark all riparian protection area boundaries including the drip line (root zone) of riparian trees.

☑ Erect easily visible fencing (temporary or permanent) to protect the riparian protection area from access by construction crews.

☑ Prevent all access inside the riparian protection area, except that authorised in the development plans and approvals and associated with authorised construction activities.

☑ Prevent damage to riparian vegetation and their root systems from machinery working on the development site.

☑ Maintain wildlife trees in riparian areas. If trees have been designated as a hazard, modify work areas to avoid the danger zone or consider topping the tree at 5 m or higher to retain some wildlife values. Where trees can not be topped, they should be felled and left lying in the riparian area as **coarse woody debris.** Note that a Hazard Tree Assessor is the only qualified professional for assessing danger trees but that this assessor may not be sensitive to wildlife needs. For more information see *Best Management Practices for Hazard Tree and Non-Hazard Tree Limbing, Topping or Removal.*

[2] Regional best management practices will be added to Version 2 of this document.

☒ When removing trees from outside of the riparian protection area, do not allow these trees to fall into the riparian zone, and do not haul them away through the protection zone.

☒ Do not clear native vegetation within the protection areas. The roots of these plants hold the soil in place and prevent excessive erosion, as well providing important habitat for a variety of wildlife. Rotting logs and other woody debris provide critical habitat for many species in riparian areas and recycle nutrients back into the soils.

☑ Conduct fuel reduction and management of **ladder fuels** without degrading riparian habitats by trimming lower dead branches but maintaining green shrubby vegetation.

### PROTECT WATER QUALITY DURING CONSTRUCTION

☑ Control erosion and prevent the movement of sediment and other **deleterious substances** into the riparian protection area and/or the aquatic ecosystem. Failure to do so may result in charges or an Inspectors Order under the *Fisheries Act* and the *Waste Management Act*. For more information see Section 4.4.8 Erosion and Sediment Control and the Water Quality Municipal Best Management Practices for Construction Design website.

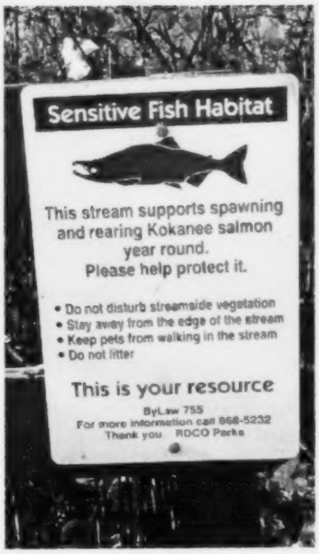
☑ Keep all construction fuelling stations as well as mobile fuelling equipment well away (30 metres or more) from the riparian protection area to prevent the potential contamination of the aquatic and riparian ecosystems.

☑ Keep all fresh concrete and concrete equipment wash water well away from the riparian protection area, aquatic ecosystems and out of stormwater systems with connections to these areas.

☒ Do not allow fill or other construction materials to encroach on the riparian protection area.

☒ Avoid the use of pesticides and other toxins in riparian areas.

☑ For more information, see Appendix III of the *Standards and Best Practices for Instream Works.*


Sensitive Fish Habitat
This stream supports spawning and rearing Kokanee salmon year round.
Please help protect it.
• Do not disturb streamside vegetation
• Stay away from the edge of the stream
• Keep pets from walking in the stream
• Do not litter
This is your resource
ByLaw 755
For more information call 868-5232
Thank you RDCO Parks

Let people know they are in a sensitive area.

PHOTO T. CASHIN

### AVOID WATER LEVEL FLUCTUATIONS IN AMPHIBIAN HABITAT

Changes in surface water levels and flows can have significant impacts on amphibian habitats and water quality.

☑ Follow the guidelines in *Best Management Practices for Amphibians and Reptiles in Urban and Rural Environments in British Columbia.*

### DAYLIGHT CULVERTED STREAMS WHERE POSSIBLE

☑ Take advantage of opportunities to 'daylight' culverted streams during re-development. The benefits of doing so include the creation of visual amenities, passive parks for human use and stormwater management opportunities, as well as habitat enhancement.

### 7.4.4 Protection After Development

#### PROTECT RIPARIAN VEGETATION AFTER DEVELOPMENT

☑ Construct permanent fences to minimise access to riparian protection areas.

☑ Leave fallen and topped trees on the ground to provide habitat for salamanders and a wide variety of insects. Coarse woody debris plays a critical role in riparian habitats. Removal of fine fuels will help fireproof fallen logs and topped trees.

☑ When pruning trees to improve sightlines, prune selected branches rather than cutting the main tree trunk. This will allow the tree to continue to grow and its roots to hold the bank in place.

☑ Remove **invasive species** (such as purple loosestrife and Himalayan blackberry) that are found in the riparian protection area, being careful not to damage the native riparian vegetation. Invasive species can seriously degrade aquatic and riparian ecosystems and are most easily dealt with before they become widespread. Removal of invasive species should only be undertaken with expert advice, as improper removal can encourage the spread of invasives. Persistence is required when dealing with invasive species as re-growth is common until native species can again establish.

☑ Provide signage that lets people know they are in a sensitive area.

The American Bullfrog is an invasive alien species that has taken over many lakes and wetlands in British Columbia. It is a voracious predator that eats other frogs and amphibians, fishes, small snakes, and even small songbirds and baby ducks.

#### PROTECT WATER QUALITY AND QUANTITY AFTER DEVELOPMENT

☑ Follow the guidelines set out in *Stormwater Planning: A Guidebook for British Columbia* (Chapters 6 and 7) and Water Balance Model to protect water quality and quantity.

### 7.4.5 Restoration and Enhancement of Damaged Aquatic and Riparian Ecosystems

#### RESTORE AND ENHANCE DAMAGED AQUATIC AND RIPARIAN ECOSYSTEMS

☑ Enhance or restore the vegetation within riparian protection areas where clearing has occurred. Appropriately qualified professionals can provide advice on suitable species and planting patterns. The use of potentially invasive species in restoration work (such as reed canary grass *Phalaris arundinacea*) may result in significant damage to the aquatic and riparian ecosystem and should be avoided.

☑ For information on aquatic and riparian restoration, see Streamline, the Watershed Restoration Technical Bulletin.

☑ Consider the consequences of beaver activities on restored wetlands and plan to mitigate potential plant losses prior to undertaking restoration work. For more information see *Best Managemnet Practices for Instream Works. Specific Standards and Best Practices: Beaver and Beaver Dam Management* and *Beaver Management Guidelines*.

The Wetlands Institute offers a seven-day field experience where stewardship coordinators, city planners, teachers, First Nations, ministry and municipality staff, NGO staff, business leaders and others come together to learn wetland conservation skills. For information contact wetlands@netidea.com

### 7.4.6 Human Access to Aquatic and Riparian Ecosystems

#### Control access to aquatic and riparian ecosystems

☒ Avoid providing access to particularly sensitive areas such fish spawning areas, turtle nesting areas, heron rookeries or habitats with species at risk. Some species are far more sensitive to human disturbance than others. A species inventory can assist in planning access to riparian areas.

☑ For more information on designing access near aquatic areas, see *Access Near Aquatic Areas: A Guide to Sensitive Planning, Design, and Management*.

### 7.4.7 Ecosystem-Specific Best Management Practices

#### Wetlands

**"Wetlands" include many different types of wetted area, including bogs, swamps, shallow water wetlands and marshes. For information on wetland classification, see "The Ecology of Wetland Ecosystems."**

Even small wetland areas can help protect water quality. Simple practices such as these can help maintain the integrity and effectiveness of wetlands.

☑ Consider the whole watershed function when attempting to preserve its critical components such as wetlands.

☑ Apply best management practices for sediment control (see Section 4.4.8: Erosion and Sediment Control) on all developments to reduce sediment inputs to wetland systems.

☑ Maintain vegetated buffers around wetland areas (see Table 4-1 for suggested buffer distances). Buffers should be measured from the outer boundary of the wetland vegetation.

☒ Never divert water from wetland areas. Preserve existing drainage ways.

☒ Avoid crossing wetlands if possible. If required, use docks or boardwalks to cross a wetland rather than filling in.

☑ Design trails along high ground even if it means a longer walk to the shore

☑ For information on the care of wetlands, see *Wetlandkeepers Handbook: A practical guide to wetland care* or the Wetkit website.

#### Vernal Pools

Vernal pools are sensitive habitats that are often home to rare species. They are often undervalued as they only retain water on a temporary basis. Some are highly alkaline.

☑ Identify and protect vernal pools during and after development. See environmentally sensitive area section.

☒ Do not turn vernal pools into year-round water features. Local species have adapted to these habitats and the process can add predators such as fish or other species that require year round habitat that might out-compete species adapted to the drying

Canada Geese.
PHOTO: DAVE POLSTER

cycle. Year-round water can also change the water chemistry and impact species that have adapted to the alkaline conditions.

☑ For more information on creating vernal pools to provide wildlife habitat, see *A Guide to Creating Vernal Ponds*.

### LAKESHORES

☑ The publication *Living By Water* offers advice for shoreline homeowners on ways to protect and enhance their shoreline.

☑ For lakeshore stabilisation activities, refer to the *Best Management Practices for Lakeshore Stabilization.* Lakeshore stabilisation techniques can have a detrimental impact on fish, amphibians and other lakeshore species.

### MARINE SENSITIVE ZONES

These recommendations focus on estuaries and adjacent upland areas only.

☑ For information on the protection of marine sensitive zones, see the *Coastal Shore Stewardship: A Guide for Planners, Builders and Developers*, *Shoreline Structures Environmental Design: A Guide for Structures along Estuaries and Large Rivers* and *Caring for Our Shores: A Handbook for Coastal Landowners in the Strait of Georgia.*

## 7.5 USEFUL SOURCES

*For complete references and a more extensive reading list, see the Bibliography.*

### LEGISLATION:

For a full listing of **provincial government legislation**, see http://www.qp.gov.bc.ca/statreg/list_statreg_1.htm

B.C. *Fish Protection Act:* http://www.qp.gov.bc.ca/statreg/stat/F/97021_01.htm

Streamside Protection Regulation: http://www.qp.gov.bc.ca/statreg/reg/F/FishProtect/10_2001.htm

B.C. *Waste Management Act:* http://www.qp.gov.bc.ca/statreg/stat/W/96482_01.htm

B.C. *Water Act:* http://www.qp.gov.bc.ca/statreg/stat/W/96483_01.htm

For a full listing of **federal government legislation**, see: http://laws.justice.gc.ca/en/

Canada *Fisheries Act* http://laws.justice.gc.ca/en/F-14/index.html

### INVENTORY AND MAPPING:

Sensitive Habitat Inventory and Mapping (SHIM) website (part of the Community Mapping Network): http://www.shim.bc.ca/maps.html

Fisheries Inventory Summary System (FISS): http://www.bcfisheries.gov.bc.ca/fishinv/fiss.html

Fish Wizard: http://www.fishwizard.com/

SHIM data: http://www.shim.bc.ca/shim/shimloginscreen2.htm

B.C. Wetlands Atlas: http://www.shim.bc.ca/wetland/main.htm

South Coast Cutthroat Atlas: http://www.shim.bc.ca/cutthroat/main.htm

Eelgrass Bed Mapping Atlas: http://www.shim.bc.ca/eelgrass/main.htm

Conservation Data Centre report of findings: http://srmwww.gov.bc.ca/cdc/contribute.html

### BEST MANAGEMENT PRACTICES:

These Best Management Practices documents will be posted on the Ministry of Water, Land and Air Protection website (http://wlapwww.gov.bc.ca/wld/BMP/bmpintro.html) in the near future. Some drafts are available for review on other websites, or from Ministry offices, as noted below. Comments on these drafts can be sent to Marlene Caskey (Marlene.Caskey@gems7.gov.bc.ca) or Dr. Grant Bracher (Grant.Bracher@gems2.gov.bc.ca).

*Best Management Practices for Instream Works. Specific Standards and Best Practices: Beaver and Beaver Dam Management:* http://wlapwww.gov.bc.ca/wld/BMP/beaver.html

*Beaver Management Guidelines.* http://wlapwww.gov.bc.ca/vir/pa/Beaver-Guide.pdf

*Best Management Practices for Hazard Tree and Non-Hazard Tree Limbing, Topping or Removal.* Ministry of Water, Land and Air Protection, Okanagan Region. Penticton, B.C. For a copy contact Susan Latimer, Susan.Latimer@gems1.gov.bc.ca

*Best Management Practices for Lakeshore Stabilization.* Ministry of Water, Land and Air Protection, Okanagan Region, Penticton, B.C. For a copy contact Susan Latimer, Susan.Latimer@gems1.gov.bc.ca

*Best Management Practices for Amphibians and Reptiles in Urban and Rural Environments in British Columbia*: http://www3.telus.net/public/leahmalk/BMP.pdf

*Standards and Best Practices for Instream Works:* http://wlapwww.gov.bc.ca/sry/iswstdsbpsmarch2004.pdf

To contact regional Ministry of Water, Land and Air Protection offices see http://wlapwww.gov.bc.ca/main/prgs/regions.htm

### STEWARDSHIP AND RESTORATION OF AQUATIC AND RIPARIAN AREAS

All of the publications in the Stewardship Series are available at http://www.stewardshipcentre.bc.ca/sc_bc/stew_series/bc_stewseries.asp

*Access Near Aquatic Areas: A Guide to Sensitive Planning, Design and Management.*
*Coastal Shore Stewardship: A Guide for Planners, Builders and Developers*
*Land Development Guidelines for the Protection of Aquatic Habitat*
*Stream Stewardship: A Guide for Planners and Developers*
*Shoreline Structures Environmental Design: A Guide for Structures along Estuaries and Large Rivers*
*The Streamkeepers Handbook: A Practical Guide to Stream and Wetland Care*
*Wetlandkeepers Handbook: A practical guide to wetland care*
Banner, A. and W. McKenzie. 2000. "The Ecology of Wetland Ecosystems." B.C. Ministry of Forests Extension Note #45. http://www.for.gov.bc.ca/hfd/pubs/docs/En/En45.pdf

B.C. Lake Stewardship Society: http://www.nalms.org/bclss/

Cowichan Community Land Trust and Marine Ecology Station. *Caring for Our Shores: A Handbook for Coastal Landowners in the Strait of Georgia.* http://www.island.net/~cclt/links.htm

Living by Water. 2002. *On the Living Edge: Your Handbook for Waterfront Living.* http://www.livingbywater.ca

Land and Water B.C. "A User's Guide to Working in and around Water - Regulation under B.C.'s Water Act" Revised January 2001. http://lwbc.bc.ca/water/brochures/user_guide.pdf

B.C. Ministry of Agriculture, Food and Fisheries information on the management of fish and wildlife habitats: http://www.agf.gov.bc.ca/resmgmt/fppa/refguide/activity/870218-39_Habitat_Management.pdf

B.C. Ministry of Forests. 1995. Riparian Management Area Guidebook. Forest Practices Code. http://www.for.gov.bc.ca/tasb/legsregs/fpc/fpcguide/riparian/Rip-toc.html

B.C. Ministry of Forests. 2002. Fish-stream Crossing Guidebook. Forest Practices Code of British Columbia Guidebook. http://www.for.gov.bc.ca/tasb/legsregs/fpc/FPCGUIDE/FishStreamCrossing/FSCGdBk.pdf

B.C. Ministry of Water, Land and Air Protection – Lower Mainland Region. 2002. So, You Want To Cross That Stream On Your Property? Environmental Stewardship Standards and Recommended Best Practices - Instream Works Type No. 2. Information Bulletin. 13 p.

B.C. Ministry of Forests. *Windthrow Handbook for British Columbia Forests.* http://www.for.gov.bc.ca/hfd/pubs/Docs/Wp/Wp01.htm

B.C. Ministry of Sustainable Resource Management. Streamline: A Watershed Restoration Technical Bulletin: http://srmwww.gov.bc.ca/frco/bookshop/streamline.html

Biebighauser, T. 2002. *A Guide to Creating Vernal Ponds.* U.S. Department of Agriculture, Izaak Walton League of America and Ducks Unlimited, Inc. http://herpcenter.ipfw.edu/index.htm?http://herpcenter.ipfw.edu/outreach/VernalPonds/index.htm&2

Wetkit website: http://www.wetkit.net/

### STORMWATER MANAGEMENT

*Stormwater Planning: A Guidebook for British Columbia*
http://wlapwww.gov.bc.ca/epd/epdpa/mpp/stormwater/stormwater.html

Water Balance Model website: http://www.waterbalance.ca/sql/home/index.asp

## APPENDIX 7-1: DEFINITIONS

See also Glossary

Aquatic ecosystem: Any body of water, such as a stream, lake, estuary or wetland, and all of the organisms and non-living components within it, functioning as a natural system.

Coarse woody debris: Sound or rotting logs, stumps or large branches that have fallen or been cut and left in the woods; or trees and branches that have died but remain standing or leaning.

Deleterious substance: Any substance that, if added to water, would degrade or alter the quality of the water so that it becomes damaging to fish or fish habitat, or becomes unsuitable for human consumption or any other purpose for which it is legally licensed (such as irrigation and livestock watering).

Ecological integrity: A continuum of characteristics that a landscape should possess. These include ecosystem health, biodiversity, stability and sustainability through the maintenance of structural and functional components of the system in perpetuity.

Ecosystem features: The physical components of the ecosystem (such as snags and large woody debris) that help maintain the diversity and processes associated with a healthy ecosystem.

Ecosystem functions: The physical, chemical and biological processes that keep an ecosystem operating. Examples include infiltration of surface water, evapo-transpiration and nutrient cycling.

Erosion: A natural process of sediment movement as a consequence of water currents, rainfall runoff, or wind, which may be considered beneficial or detrimental, depending upon the associated environmental concerns.

Estuary: A partially enclosed body of water freely connected to the ocean, within which the seawater is diluted by mixing with freshwater and where tidal fluctuations affect stream water levels. The estuary is a dynamic system typified by brackish (mixed fresh and salt) water, variable and often high nutrient levels and by shallow water conditions often associated with marsh plants in upper tidal zones and eelgrass in lower tidal zones.

Feathering: A method of partially trimming trees so that they are windfirm (better able to resist windthrow).

Invasive species: Plants, animals and micro-organisms that colonise and take over the habitats of native species. Most invasive species are also alien (non-native) to the area, and can become predominant because the natural controls (predators, disease, etc.) that kept populations in check in their native environment are not found in their new location.

Ladder fuels: Fuels that provide vertical continuity between ground fuels and the crowns of trees, contributing to the ease of a tree igniting.

Marine sensitive zone: Marine-sensitive zones (MSZs) include herring spawning areas, shellfish beds, marsh areas, existing aquaculture sites, juvenile salmonid rearing areas, and adult salmon holding areas. For the purposes of this document, marine sensitive zones refer primarily to estuaries and their foreshore areas.

Riparian ecosystem: A terrestrial ecosystem where the vegetation complex and microclimate conditions are the product of combined presence and influence of perennial and/or intermittent water, associated high water tables, and soils that exhibit some wetness characteristics. The riparian ecosystem is influenced by, and exerts an influence on, the associated aquatic ecosystem.

Riparian protection area: The area adjacent to a stream that may be subject to temporary, frequent or seasonal inundation, and supports plant species that are typical of an area of inundated or saturated soil conditions, and that are distinct from plant species on freely drained adjacent upland sites because of the presence of water.

Stream: a natural watercourse or source of water supply, whether usually containing water or not, ground water, and a lake, river, creek, spring, ravine, swamp and gulch.

Top of bank: The points closest to the natural boundary (or high water mark) of a watercourse where a break in slope occurs such that the grade beyond the break is flatter than 3 (horizontal) to 1 (vertical) for a minimum of 15 metres measured perpendicularly from the watercourse. Small slopes beyond the initial break in slope that are steeper than 3:1 but are less than 1 meter in height can be included in the determination of the 15 metre distance from the top of bank. Where banks are not well defined (e.g. in the case of lakes, wetlands or ponds), the top of the bank is equivalent to the natural boundary or seasonal high water mark.

Vernal pool: A temporary body of freshwater that is filled by spring rains and snowmelt, only to dry up during the hot, dry summer months. Many vernal pools are filled again by autumn rains, and may persist throughout the winter.

Wetland: Land that is inundated or saturated by surface or groundwater at a frequency and duration sufficient to support vegetation typically adapted for life in saturated soil conditions, including swamps, marshes, bogs, fens, vernal pools and estuaries.

Wildlife corridor: A travel corridor for wildlife. This ranges from very wide, natural corridors for large mammals, to 'sky corridors' that offer a safe flight path between feeding and resting places for birds, to smaller man-made corridors (such as urban trails) that provide safe passage for smaller creatures. These corridors also provide year-round habitat for less mobile species.

Windthrow: A tree or trees uprooted or broken off by the wind. Also known as blowdown.

Woody debris: Sound or rotting logs, stumps or large branches that have fallen or been cut and left in the woods or water; or trees and branches that have died but remain standing or leaning. These provide cover for small animals and their predators (both fish and wildlife).

## APPENDIX 7-2:
## ECOLOGICAL FEATURES AND FUNCTIONS OF AQUATIC AND RIPARIAN ECOSYSTEMS

To maintain the ecological integrity of aquatic ecosystems, it is important to maintain the ecological features and functions across the landscape. These include:

- The forest and ground cover adjacent to streams that moderates water temperatures, provides a source of food, nutrients and organic matter to streams, establishes root matrices that stabilise soils and streambanks thereby minimising erosion, and buffers streams from sedimentation and pollution in surface runoff;
- The presence of organic debris that falls into the stream or streamside area, including leaves and twigs, logs, and root wads;
- The exchange of nutrients between terrestrial and aquatic systems;
- Side channels, intermittent streams, seasonally wetted contiguous areas and floodplains;
- A natural source of streambed substrates;
- Areas for lateral channel migration (active floodplains); and
- Permeable surfaces that permit infiltration to moderate water volume, timing and velocity and maintain sustained water flows in streams, especially during low (base) flow periods.

THIS IS PART OF A SERIES OF BEST MANAGEMENT PRACTICES DOCUMENTS

# Environmental Best Management Practices for Urban and Rural Land Development

June 2004

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## Summary

Best management practices for pollution prevention during land development include:

### CONTAMINATED SITES

- Prevent site contamination
- Avoid activities that allow the escape or spread of contaminated materials

### SPILL CONTAINMENT AND REPORTING

- Practice spill prevention
- Be prepared for spills
- Respond quickly when a spill occurs

### PESTICIDES

- Use integrated pest management approaches
- Only use pesticides as absolutely necessary

### GROUNDWATER AND WELLS

- Maintain water quantity
- Maintain water quality

### MUNICIPAL LIQUID WASTE

- Regulate on-site sewage disposal systems
- Reduce urban runoff
- Follow established guidelines for liquid waste management

### SOLID WASTE

- Reduce solid waste
- Reduce construction waste

### AIR QUALITY

- Include air quality goals in long term plans
- Design communities to promote 'clean' transportation options
- Develop policies that promote energy efficiency
- Develop bylaws to protect air quality
- Regulate open burning
- Consider air quality in development design

### WATER QUALITY

- Maintain and enhance water quality

# Pollution Prevention and Management

This section of *Environmental Best Management Practices for Urban and Rural Land Development* provides a brief outline of pollution management issues. It includes discussions of:

- Contaminated Sites
- Spill Containment and Reporting
- Pesticides
- Groundwater and Wells
- Municipal Liquid Waste
- Solid Waste
- Air Quality
- Climate Change and
- Water Quality

Each of these subjects is covered extensively in separate Ministry of Water, Land and Air Protection initiatives. The purpose of this section is to provide an introduction to these topics in the context of urban and rural land development, as well as a brief outline to the considerable resources provided by the Ministry.

In dealing with each of these topics, the Ministry's goals are to:

- Protect the environment and human health and safety by ensuring clean and safe water, land and air; and
- Maintain and restore the ecological diversity of fish and wildlife species and their habitats.

For local governments and land developers dealing with these issues, specialised professional input will frequently be required.

## 8.1 CONTAMINATED SITES

Where commercial and industrial activities take place, toxic substances such as PCBs, lead, cadmium and hydro-carbons may build up in the soil, surface water and groundwater. Sites are considered **contaminated**[1] if these toxins reach levels at which they pose a threat to the environment, human health or the safety of underground services (such as short circuits in street lighting), making them unsuitable for specific land or water uses.

For land developers, the impacts of legal and financial implications of historic contamination can be significant. Soil removal/replacement can be costly, and there may be restrictions on the types of permitted development. Groundwater impacts may restrict land use unless dealt with appropriately during **remediation**, and the costs of remediation of groundwater contamination may be even higher than for soil cleanup. Note that at sites where risk assessment has been used to define the remediation process, or where sites have been cleaned up to a lesser standard, restrictions on land use will continue, and excavation and disposal of soil from the site may also be restricted.

It cost tens of millions of dollars for soil remediation and clean-up for the Concorde development on Vancouver's False Creek, before development could even begin.

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[1] Definitions are provided in Appendix 8-1 and in the Glossary

### 8.1.1 Identifying a Contaminated Site

In order to determine if a site is contaminated, the site must be assessed/investigated as required under provincial regulations. This assessment is initiated during completion of a Site Profile or during completion of a Phase 1 or Stage 1 Preliminary Site Investigation. Developers are advised to verify the status of a property prior to acquisition.

One of the objectives of the Contaminated Sites Regulations is to provide a method of screening for potentially contaminated sites. The initial process most often involves the completion of a Site Profile, which will include an investigation of the historical land use. For more information on Site Profiles, see http://wlapwww.gov.bc.ca/epd/epdpa/contam_sites/fact_sheets/19.html.

Even when the proposed development site is not known to have historical land uses that were of concern, the surrounding historical land uses may have impacted the property. Ministry resources can help to identify known contaminated sites in an area through the site registry and site specific information requests. For information on the site registry, see http://wlapwww.gov.bc.ca/epd/epdpa/contam_sites/fact_sheets/20sitregv2.pdf.

If a site is determined to be potentially contaminated then additional investigation and assessment of the sites is required. Requirements for site investigations are identified in numerous regulations, protocols and other documents provided on the Ministry's Contaminated Sites website: http://wlapwww.gov.bc.ca/epd/epdpa/contam_sites/.

### 8.1.2 Objectives

The objectives related to development activities on potentially contaminated sites are:

- To ensure the protection of the water, land and air, and the health of humans and wildlife;
- To ensure the safety of those using the area during and after development;
- To ensure that personnel involved in the remediation are protected in accordance with the Occupational Health and Safety Regulation; and
- To ensure that the site is appropriately investigated and remediated by qualified professionals to an appropriate standard.

### 8.1.3 Applicable Legislation

Developments on contaminated sites are governed by the following legislation and regulations:

- The *Environment Management Act* (http://www.legis.gov.bc.ca/37th4th/1st_read/gov57-1-toc.htm) has just recently replaced the *Waste Management Act* (http://www.qp.gov.bc.ca/statreg/stat/W/96482_01.htm). It provides the framework for regulations. Check the Ministry website for updates: http://wlapwww.gov.bc.ca/epd/waste_mgt_review/.
- Contaminated Sites Regulations (http://www.qp.gov.bc.ca/statreg/reg/W/WasteMgmt/WasteMgmt375_96/375_96.htm): provides detailed regulations.

At the time of writing (March 2004), the Contaminated Sites Regulation is under review by the Minister's Advisory Panel on Contaminated Sites. For updates, see http://wlapwww.gov.bc.ca/epd/epddpa/contam_sites/ministers_panel/ministerspanel.html

- At the time of writing portions of the Hazardous Waste Regulation still apply to the storage, treatment or disposal of certain materials. For more information see: http://www.qp.gov.bc.ca/statreg/reg/W/WasteMgmt/WasteMgmt63_88Special/63_88.htm
- *Land Titles Act* (http://www.qp.gov.bc.ca/statreg/stat/L/96250_00.htm): addresses Site Profile exemptions and registration of covenants.
- *Local Government Act* (http://www.qp.gov.bc.ca/statreg/stat/L/96323_00.htm), Vancouver Charter (http://www .qp.gov.bc.ca/statreg/stat/V/vanch_00.htm) and *Islands Trust Act:* (http://wwwqp.gov.bc.ca/statreg/stat/I/96239_01.htm): contain contaminated sites provisions related to various municipal permits.
- *Property Law Act* (http://www.qp.gov.bc.ca/statreg/stat/P/96377_01.htm): deals with real estate transactions.
- *Petroleum and Natural Gas Act* (http://www.qp.gov.bc.ca/statreg/stat/P/96361_01.htm): provides for certificates of restoration.

Recent changes to the Contaminated Sites Regulations set out a five-part management process for dealing with contaminated sites. The five steps are:

- Identification and assessment;
- Investigation and determination/decision;
- Planning and determining liability;
- Remediation; and
- Evaluation/monitoring.

For more information on these five steps see Appendix 8-2.

**QUALIFIED PROFESSIONALS**

The Ministry of Water, Land and Air Protection maintains a list of qualified professionals for contaminated sites management. See: http://wlapwww.gov.bc.ca/epd/epdpa/contam_sites/roster/roster_of_experts.html Additional information about qualified professionals is also provided by the Association of Professional Engineers and Geoscientists of B.C., available online at www.apeg.bc.ca.

### *8.1.4 Best Management Practices for Local Governments and Developers*

PREVENT SITE CONTAMINATION

☑ Implement pollution prevention strategies, which are far more cost effective than having to remediate after the fact.

☑ Practice due diligence when preparing property transactions, including providing/requesting a site profile where required. For more information see the "Highlights for Realtors, Property Vendors and Purchasers" http://wlapwww.gov.bc.ca/epd/epdpa/contam_sites/fact_sheets/11.html

☑ If in doubt, contact the Ministry or a qualified professional with contaminated sites experience.

#### AVOID ACTIVITIES THAT ALLOW THE ESCAPE OR SPREAD OF CONTAMINATED MATERIALS

☑ Whenever contamination is suspected, avoid activities that would spread or allow escape of the contaminated materials.

### *8.1.5 Useful Sources*

The Ministry of Water, Land and Air Protection maintains a Contaminated Sites website at: http://wlapwww.gov.bc.ca/epd/epdpa/contam_sites/index.html. This website includes extensive information for local governments and land developers.

## 8.2 SPILL CONTAINMENT AND REPORTING

Accidental release of contaminants can have serious environmental and financial implications to the community and to the person or company responsible for the spill. This section provides guidance when dealing with accidental release of contaminants, such as:

- Fuels, special wastes, dangerous goods and other hazardous substances; or
- The release of sediments, drilling salts/mud, construction materials, sewage and other polluting substances.

### *8.2.1 Objectives*

The objectives related to spill containment and reporting on development sites are:

- To minimise the ecological, legal and financial consequences of accidental spills; and
- To provide environmentally-sound and technically-feasible approaches to prevent spills and to mitigate and recover from spill impacts.

### *8.2.2 Applicable Legislation*

Spill containment and reporting is governed by the following legislation and regulations:

- *Environment Management Act*, Spill Reporting Regulation (http://www.qp.gov.bc.ca/statreg/reg/W/WasteMgmt/263_90.htm): specifies the requirements related to reporting and to taking action regarding the spill.
- *Local Government Act* (http://www.qp.gov.bc.ca/statreg/stat/L/96323_26.htm#part26_division12): Part 26, Division12 governs municipal approvals of site profiles for contaminated sites.
- *Canada Fisheries Act* (http://laws.justice.gc.ca/en/F-14/60199.html#rid-60275/): governs the release of deleterious substances into fish habitat (s 34-43).

PHOTO: DAVE POLSTER

### 8.2.3 Best Management Practices for Developers

PRACTICE SPILL PREVENTION

☑ Develop a plan that identifies potential accidents and ways to avoid them.

☑ Become familiar with any local government bylaws regarding spill containment.

BE PREPARED FOR SPILLS

☑ Have a response plan and prior arrangements with qualified spill contractors to handle spills.

☑ Provide (or have arrangements) for suitable disposal of spill materials and contaminated soils, water, and other materials.

☑ Train workers in spill prevention and the ways to respond should a spill occur.

Report spills to the Provincial Emergency Plan: call 1-800-663-3456

RESPOND QUICKLY WHEN A SPILL OCCURS

☑ Immediately contain or control a spilled material, or reduce any threats from the spill, such as water contamination.

☑ Ensure the safety and protection of all personnel on the site.

☑ Report all spills to the Provincial Emergency Program (1-800-663-3456) as required under the provincial *Environment Management Act* Spill Reporting Regulations and federal legislation.

### 8.2.4 Useful Sources

Provincial spill notification overview:
http://wlapwww.gov.bc.ca/eeeb/spillnoti/notifica.html

Industrial emergency response plan preparation:
http://wlapwww.gov.bc.ca/eeeb/indusguide/industcplan.html

Federal Environmental Emergencies Program http://www.ec.gc.ca/ee-ue/home/home_e.asp

Examples of municipal best management practices used in the City of Victoria:
http://www.city.victoria.bc.ca/cityhall/pdfs/rockbay_bsnsss.pdf

Workplace Hazardous Materials Information System (WHIMIS) regulations under provincial Occupational Health and Safety Regulations:
http://regulation.healthandsafetycentre.org/s/Part5.asp?ReportID=18022&hilite=whmis

Transport of Dangerous Goods (TDG) regulations:
http://www.tc.gc.ca/tdg/clear/part8.htm

Partnerships Toward Safer Communities (PTSC) program to improve public safety and safety of emergency responders by reducing the frequency, severity and consequence of natural and human caused emergency incidents: http://www.ptsc-program.org/

Canadian Society for Chemical Engineering (CSCHE) Process Safety Management *Division product loss prevention programs* that promotes awareness, understanding and use of process safety management (PSM) tools, services and techniques within Canadian facilities including manufacturing and distribution operations, research facilities and laboratories: http://www.chemeng.ca/maine.html

National Fire Protection Association (NFPA) codes and standards, research, training, and education pertaining to spill prevention, mitigation and recovery: http://www.nfpa.org/catalog/home/index.asp

Canadian Council of Ministers of the Environment (CCME) environmental standards, strategies and objectives: http://www.ccme.ca/about/index.html

Canadian Chemical Producers' Association (CCPA) Responsible Care program to promote safe and environmentally sound management of chemicals throughout their life cycle: http://www.ccpa.ca/english/who/index.html

International Organisation for Standardisation (IS0) technical standards: http://www.iso.ch/iso/en/aboutiso/introduction/index.html

British Columbia Used Oil Management Association program to facilitate and increase collection, management and recycling of used lubricating oil in British Columbia: http://www.usedoilrecycling.com/html/about.htm

Coast Guard Tank Truck to Marine transfer requirements: http://www.pacific.ccg-gcc.gc.ca/er/oiltransfer/index_e.html

## 8.3 PESTICIDES

**Pesticides** are materials that are used to reduce the damage from pests by killing or repelling them. They include herbicides used to kill plants, insecticides used to kill insects, fungicides used to kill fungal organisms (mould, rot, etc.) as well as treatments used as wood preservatives.

### *8.3.1 Objectives*

The objectives related to pesticide use during land development are:

- To ensure the protection of the water, land and air, and the health of humans and wildlife; and
- To ensure that pesticides are used safely.

### *8.3.2 Applicable Legislation*

Storage of pesticides and disposal of pesticide containers is strictly regulated. Many pesticide applications must only be made by trained and registered applicators. Approvals are required for public land applications and certain large scale private lands.

Pesticide use is governed by the following legislation and regulations:

- B.C. *Pesticide Control Act* (http://www.qp.gov.bc.ca/statreg/stat/P/96360_01.htm). This is being replaced by the *Integrated Pest Management Act* (http://www.legis.gov.bc.ca/37th4th/3rd_read/gov53-3.htm) which will come into effect when the associated regulations are completed—probably in the late summer of 2004.

- B.C. *Pesticide Control Act* Regulation (http://www.qp.gov.bc.ca/statreg/reg/P/319_81.htm) governs the sale, use and handling of pesticides.
- Canada *Pest Control Products Act* (http://laws.justice.gc.ca/en/P-9/) regulates products used for the control of pests and the organic functions of plants and animals.

### 8.3.3 Best Management Practices for Local Governments and Developers

Before any pesticide use can be justified there should be a comprehensive assessment of the need and impacts on a program basis. **Integrated Pest Management** (IPM) is the decision making process that will lead to appropriate strategies and actions for reducing pest damage which may or may not involve the use of pesticides. If pesticides are selected through the IPM process, their use will have been selected as being both necessary and the most appropriate control for the situation. Practicing IPM will also direct the land manager to pest prevention and future reduction in the need to apply pesticides.

#### USE INTEGRATED PEST MANAGEMENT APPROACHES

☑ Develop and follow an Integrated Pest Management (IPM) approach for all pest problems, including the following principles:

(a) planning and managing ecosystems to prevent organisms from becoming pests;
(b) identifying potential pest problems;
(c) monitoring populations of pests and beneficial organisms, pest damage and environmental conditions;
(d) using injury thresholds in making treatment decisions;
(e) reducing pest populations to acceptable levels using strategies that may include a combination of biological, physical, cultural, mechanical, behavioural and chemical controls; and
(f) evaluating the effectiveness of treatments

#### ONLY USE PESTICIDES AS ABSOLUTELY NECESSARY

☑ Ensure all pesticide applications adhere to the requirements of *Pesticide Control Act* and Regulations.

☑ Consult and inform all parties who may be affected by the pest control activities.

☑ Read and follow all label directions.

☑ Hire licensed and certified applicators when required legally and if unsure of the effectiveness or impacts of the pesticides.

### 8.3.4 Useful Sources

Integrated Pest Management Control website:
http://wlapwww.gov.bc.ca/epd/epdpa/ipmp/

Pest Management Regulatory Agency (PMRA) http://www.hc-sc.gc.ca/pmra-arla/english/index-e.html

## 8.4 GROUNDWATER AND WELLS

Groundwater serves as the water source for a large number of British Columbians and their businesses. Groundwater is also an integral part of the hydrologic cycle and essential to the maintenance of ecological health for many ecosystems and the species that live there. Groundwater contributes to the year-round flow for streams and rivers.

### 8.4.1 Objectives

Protection of the groundwater system is essential for people and wildlife. Objectives for groundwater protection with regard to urban and rural land development are:

- To protect the groundwater system from pollution caused by chemicals such as pesticides and fertilisers, contaminants such as petroleum products, landfill leachates or industrial contaminants, and biological wastes such as manure and sewage; and
- To maintain groundwater levels and flows consistent with healthy ecosystems and sustainable human use.

### 8.4.2 Applicable Legislation

Groundwater use is subject to the following legislation and regulations:

- The government has recently (July/04) enacted the **Ground Water Protection Regulation (GWPR)**. The GWPR is designed to protect British Columbia's valuable ground water resource and is a new regulation under the *Water Act*. The primary purpose of the regulation is to set out standards to safeguard and maintain the integrity and efficient use of the ground water resource, and to ensure activities related to well water and ground water are undertaken in an environmentally safe manner. **Phase 1 of the regulation** deals with installing effective surface seals around wells, securely capping and floodproofing wells, and permanently closing unused wells to protect ground water quality. The GWPR also establishes the qualifications for well drillers and well pump installers and provides for a provincial registry of those possessing the qualifications (http://wlapwww.gov.bc.ca/wat/gws/)
- The *Water Utility Act* administered by Land and Water BC Inc. A water utility under the *Water Utility Act* is a person/business who owns or operates equipment or facilities for the delivery of domestic water service to five (5) or more persons or to a corporation for compensation (http://www.lwbc.bc.ca/03water/utilities/index.html). Related to this is a document entitled "Evaluating Long-Term Well Capacity for a Certificate of Public Convenience and Necessity"

(http://wlapwww.gov.bc.ca/wat/gws/gwdocs/eval_well/well.htm#P35_1246). This is a guide for professional engineers, hydrogeologists and other consultants involved with the development of groundwater supplies for private water utilities regulated under the *Water Utility Act*.

- Groundwater projects that extract large quantities of water must be reviewed under the B.C. *Environmental Assessment Act* (http://www.qp.gov.bc.ca/statreg/stat/E/02043_01.htm). For more information see Reviewable Groundwater Projects (http://wlapwww.gov.bc.ca/wat/gws/gws_eao.html).
- The *Drinking Water Protection Act* (http://www.legis.gov.bc.ca/2001/3rd_read/gov20-3.htm) governs groundwater that is used for drinking water supply.

### 8.4.3 Best Management Practices for Local Governments

*Reining in the Rain* is a case study of the city of Bellingham's use of rain gardens to manage stormwater in parking lots. http://www.psat.wa.gov/Publications/Rain_Garden_book.pdf

MAINTAIN WATER QUANTITY

☑ Ensure that there is a sufficient water supply for household, fire suppression and other needs before approving subdivisions. Hire a professional groundwater consultant for fractured bedrock aquifers, community well systems and complex hydrogeologic conditions.

☑ Consider other groundwater/well users when approving developments, to avoid aquifer over-use and subsequent incursions of salt water or poor water quality.

☑ Design stormwater systems to maximise the infiltration of uncontaminated stormwater to augment groundwater supplies (see the Stormwater Runoff website and *Stormwater Planning: A Guidebook for British Columbia* below in Useful Sources.

MAINTAIN WATER QUALITY

☑ Ensure that Well Protection Plans are conducted consistent with the Well Protection Toolkit.

☑ Ensure that land use planning considers water quality and water source protection.

### 8.4.4 Best Management Practices for Developers

MAINTAIN WATER QUANTITY

☑ Ensure groundwater supply and lot sizes are sufficient to avoid well interference. Use the guidelines in Design Guidelines for Rural Residential Community Water Systems.

☑ Recognize the limitations of living in a Mediterranean type climate where we have hot, dry summers and wet winters; design for these conditions.

☑ Promote conservation; (drought resistant vegetation, and low water-use homes).

☑ Design for preservation of natural ecosystems and wetlands.

☑ Direct rainfall into the groundwater system rather than into pipes and into surface water drainages. For more information see the *Stormwater Planning: A Guidebook for British Columbia* and the Stormwater Runoff website below in Useful Sources.

MAINTAIN WATER QUALITY

☑ Ensure proper well construction and promote the new groundwater regulations (Standards for well construction, testing, maintenance and closure; protection of well head and flood-proofing).

☑ Locate wells on high ground and away from any potential contaminant sources.

☑ Protect groundwater systems from contamination by providing and using impervious sumps for concrete wash water and other potential construction contaminants.

☒ Do not intercept shallow groundwater systems with ditches, drain tiles or other similar structures.

☑ Carefully follow manufacturer's instructions when applying pesticides or fertilisers to ensure that they do not enter the groundwater system.

☑ Design and construct sewage and septic systems to prevent leaks and ensure proper functioning condition.

☑ Close and seal abondoned wells to prevent contamination and to address safety concerns.

### 8.4.5 Useful Sources

Province of B.C. Groundwater website: http://wlapwww.gov.bc.ca/wat/gws/index.html for a wealth of information including Aquifer Mapping, the Well Log database and data from the Observation Well network. Also on the website is a link to: The *Well Protection Toolkit* (http://wlapwww.gov.bc.ca/wat/gws/well_protection/wellprotect.html): which provides guidelines for the development and implementation of a well protection plan to prevent contamination of community well water supplies in British Columbia.

Land and Water BC Inc. (http://www.lwbc.bc.ca/03water/utilities/index.html) for a publication entitled Design Guidelines for Rural Residential Community Water Systems. This guideline covers the design of new waterworks systems or extensions and replacement works to existing systems providing domestic water service for housing in rural areas.

Ministry of Health Services, Public Heath Protection: (http://www.healthservices.gov.bc.ca/protect/water.html) for information on Drinking Water Protection and particularly the publication entitled SAFE WATER SUPPLY Vital to Your Health
Stormwater Planning: A Guidebook for British Columbia (http://wlapwww.gov.bc.ca/epd/epdpa/mpp/stormwater/stormwater.html) and the Stormwater Runoff website (http://wlapwww.gov.bc.ca/wat/wq/nps/NPS_Pollution/Stormwater_Runoff/SW_Main.htm).

Environment Canada groundwater website:
http://www.ec.gc.ca/water/en/nature/grdwtr/e_gdwtr.htm
The Groundwater Foundation in the US Midwest (http://www.groundwater.org/): general information.

The National Ground Water Association (http://www.ngwa.org/): scientific information on groundwater and information for homeowners and local municipalities.

## 8.5 MUNICIPAL LIQUID WASTE

Municipal liquid waste is defined under the *Environment Management Act* as: "(a) effluent that originates from any source and is discharged into a municipal sewer system, (b) effluent from residential sources discharged to the ground, or (c) effluent specified by a manager to be included in a waste management plan."

Proper management of municipal liquid waste is essential for the health of people and natural ecosystems. Municipal liquid wastes can carry pathogenic organisms and endocrine-disrupting chemicals as well as organic matter and chemicals harmful to human health and the environment. Liquid wastes generated by industrial processes are not included in these best management practices except as these are discharged into municipal sewage systems.

### *8.5.1 Objectives*

Objectives for liquid waste management seek to minimise the impact of these materials on the people and the receiving environment. The objectives for liquid waste are:

- To ensure that discharges from municipal sewage treatment plants do not adversely affect human health and the environment;
- To meet or exceed requirements for liquid waste discharge as set out in the legislation and regulations; and
- To develop liquid waste management plans.

### *8.5.2 Applicable Legislation*

Liquid waste management is governed by the following legislation and regulations:

- The *Environment Management Act* (http://www.legis.gov.bc.ca/37th4th/1st_read/gov57-1-toc.htm) has just recently replaced the *Waste Management Act* (http://www.qp.gov.bc.ca/statreg/stat/W/96482_01.htm). Check the Ministry website for updates: http://wlapwww.gov.bc.ca/epd/waste_mgt_review/.
- Sewage Disposal Regulations: http://www.qp.gov.bc.ca/statreg/reg/H/Health/411_85.htm
- Municipal Sewage Regulation: http://wlapwww.gov.bc.ca/epd/epdpa/mpp/msrhome.html and http://www.qp.gov.bc.ca/statreg/reg/W/WasteMgmt/129_99.htm

- Conditional Exemption Regulation (http://www.qp.gov.bc.ca/statreg/reg/W/WasteMgmt/201_94.htm) (outlines when the Municipal Sewage Regulation is applicable and when the Sewage Disposal Regulation is applicable).

### 8.5.3 Best Management Practices for Local Governments

REGULATE ON-SITE SEWAGE DISPOSAL SYSTEMS

☑ Ensure that the requirements of the Sewage Disposal Regulations are met or exceeded in developing on-site residential sewage disposal systems where the discharge is less than 5000 gallons/day or 22.7 m3/day; otherwise, the Municipal Sewage Regulation applies.

☑ Follow the best management practices for on-site sewage systems provided in the Ministry's Municipal Best Management Practices for Water Quality (http://wlapwww.gov.bc.ca/wat/wq/nps/BMP_Compendium/Municipal/Municipal_Home.htm).

☑ Consult the Toolkit for the Development of Management Programs for On-site Sewage Systems (http://www.pyr.ec.gc.ca/GeorgiaBasin/reports/sewage_systems_toolkit/summary_e.htm).

PHOTO: TODD CASHIN

REDUCE URBAN RUNOFF

☑ Follow the best management practices for controlling urban runoff provided in the Ministry's Municipal Best Management Practices for Water Quality (http://wlapwww.gov.bc.ca/wat/wq/nps/BMP_Compendium/Municipal/Municipal_Home.htm).

### 8.5.4 Best Management Practices for Developers

FOLLOW ESTABLISHED GUIDELINES FOR LIQUID WASTE MANAGEMENT

☑ Follow established guidelines and regulatory requirements for liquid waste management. (Liquid Waste Management Plans in concert with the Municipal Sewage Regulation).

☑ Consult with a qualified professional in the development of liquid waste management plans and to register a discharge under the Municipal Sewage Regulation.

### 8.5.5 Useful Sources

Province of B.C. water quality best management practices: http://wlapwww.gov.bc.ca/wat/wq/nps/BMP_Compendium/BMP_Introduction/bmphome.htm

Ministry of Environment, Lands and Parks. 2002. *Urban Runoff Quality Control Guidelines for the Province of British Columbia.* Municipal Waste Branch, Environmental Protection Division. Available from Ministry of Water, Land and Air Protection offices.

*Stormwater Planning: A Guidebook for British Columbia* (http://wlapwww.gov.bc.ca/epd/epdpa/mpp/stormwater/stormwater.html)

The City of Kamloops has posted their liquid waste management plan (http://www.city.kamloops.bc.ca/water/sewer/lwmplan/options.shtml). Check other local government websites for their liquid waste management plans.

The Living by Water project provides helpful information on septic systems and sewage treatment for individual residences (www.livingbywater.ca/).

## 8.6 SOLID WASTE

**Municipal solid waste** is the normal refuse that is generated by residential, commercial, and institutional sources, as well as demolition, land clearing and construction activities. Management of solid waste in urban and rural land development centres on minimising the need to dispose of wastes by following the 4 Rs principle – Reduce, Reuse, Recycle and Recover. There will however, continue to be a need to deal with solid wastes that can not be addressed following these principles.

### *8.6.1 Objectives*

The primary objectives of the solid waste program with respect to urban and rural land development are:

- To ensure the protection of the water, land and air, and the health of humans and wildlife; and
- To minimise the amount of materials that need to be dealt with in landfills or by other disposal means.

### *8.6.2 Applicable Legislation*

Solid waste management is governed by the following legislation and regulations:

- The *Environment Management Act* has just recently replaced the *Waste Management Act* (see http://wlapwww.gov.bc.ca/epd/waste_mgt_review/).
- The *Waste Management Act* (http://www.qp.gov.bc.ca/statreg/stat/W/96482_01.htm) provided the foundation for solid waste management in British Columbia. The mandate for regional districts to prepare solid waste management plans was established in that Act in 1989. Check the Ministry website for updates: http://wlapwww.gov.bc.ca/epd/waste_mgt_review/

### *8.6.3 Best Management Practices for Local Governments*

REDUCE SOLID WASTE

☑ Develop a solid waste management plan. For more info see the Municipal Solid Waste website: http://wlapwww.gov.bc.ca/epd/epdpa/mpp/solid_waste_index.html.

### 8.6.4 Best Management Practices for Developers

REDUCE CONSTRUCTION WASTE

☑ Reduce the amount of construction and demolition refuse by encouraging source separation of materials at construction sites and deconstruction of buildings instead of machine demolition.

☑ Reduce the amount of land-clearing waste by limiting the amount of clearing undertaken. This also helps to protect natural habitats, minimize erosion and sediment concerns and may increase the property sales values.

### 8.6.5 Useful Sources

Municipal solid waste management website:
http://wlapwww.gov.bc.ca/epd/epdpa/mpp/solid_waste_index.html

Columbia Shuswap Regional District solid waste management plan website (example of waste reduction goals and techniques): http://www.csrd.bc.ca/works/solid-waste.htm

U.S. Environmental Protection Agency Municipal Solid Wastes website:
http://www.epa.gov/epaoswer/non-hw/muncpl/

The Nova Scotia government has banned land-filling of organic materials and has created significant composting facilities and an infrastructure that encourages recycling:
http://www.region.halifax.ns.ca/wrms/businesswaste.html

## 8.7 AIR QUALITY

Good air quality is essential to the health of British Columbians and the health of the local ecosystems. Poor air quality can result from industrial pollution, agricultural emissions, vehicle exhaust, open burning and from natural forest fires. Preservation of good air quality and the prevention of air quality degradation is an important part of urban and rural land development.

### 8.7.1 Objectives

The objectives for air quality during urban and rural land development are to maintain good air quality by:

- Addressing air quality in community plans;
- Promoting 'clean' transportation options; and
- Preventing or minimising actions that degrade air quality (e.g. open burning).

### 8.7.2 Applicable Legislation

The *Environment Management Act* (http://www.legis.gov.bc.ca/37th4th/3rd_read/gov57-3-toc.htm) has recently replaced the *Waste Management Act* (http://www.qp.gov.bc.ca/statreg/stat/W/96482_01.htm) as the basis for most of the air quality regulations.

The federal government can regulate a wide variety of materials, including air pollution, under the *Canadian Environmental Assessment Act* (http://laws.justice.gc.ca/en/C-15.2/)

A variety of regulations (http://wlapwww.gov.bc.ca/air/airregs.html) govern air quality, including:

- Solid Fuel Burning Domestic Appliance Reg: http://www.qp.gov.bc.ca/statreg/reg/W/WasteMgmt/302_94.htm (regulates wood stoves)
- Open Burning Smoke Control Regulation: http://www.qp.gov.bc.ca/statreg/reg/W/WasteMgmt/WasteMgmt145/145_93.htm

Local and municipal governments can pass bylaws regulating burning and other air pollutants.

Several B.C. communities are involved in airshed planning, including the Greater Vancouver Regional District http://www.gvrd.bc.ca/air/pdfs/AQMP.pdf; Bulkley Valley-Lakes District: http://www.bvldamp.ca/; and Prince George: http://wlapwww.gov.bc.ca/nor/pollution/environmental/air_mgmtplan_final.html

### 8.7.3 Best Management Practices for Local Governments

#### INCLUDE AIR QUALITY GOALS IN LONG-TERM PLANS

☑ Recognise air quality concerns in Official Community Plans to avoid incompatible land uses such as polluting sources near sensitive land use such as schools, hospitals and residences.

☑ Develop airshed plans that address the cumulative impacts of sources within an airshed or community and identify strategies to maintain or improve air quality.

#### DESIGN COMMUNITIES TO PROMOTE 'CLEAN' TRANSPORTATION OPTIONS

☑ Design communities so that walking and bicycle riding is encouraged and driving is discouraged. For more information see the Smart Growth B.C. website (www.smartgrowth.ca).

☑ Reduce standards for parking requirements in areas well served by transit.

The Greater Vancouver Regional District Sustainable Region Initiative Energy Task Group has proposed several actions to reduce energy use in the short and long term. See http://www.gvrd.bc.ca/sustainability/SRI-IssueGroupReports/report1.htm

#### DEVELOP POLICIES THAT PROMOTE ENERGY EFFICIENCY

☑ Encourage the construction of energy-efficient buildings that meet the LEED Leadership in Energy and Environmental Design) Green Building Rating System™ (see http://www.usgbc.org/LEED/LEED_main.asp).

☑ Consider high-efficiency standards for all new residential gas furnaces and boilers (i.e. 90% vs. 80% for typical new furnaces).

☑ Consider minimum efficiency standards for all new and replacement gaseous fuel boilers and heaters for industrial/institutional/commercial facilities.

#### DEVELOP BYLAWS TO PROTECT LOCAL AIR QUALITY

☑ Require the paving of all traffic areas permitted for new industrial and commercial developments (to reduce dust).

☑ Require that any new or replacement wood burning appliance meets the standards of the B.C. Solid Fuel Burning Domestic Appliance Regulation.

☑ Enact anti-idling bylaws to limit excessive on-site idling by heavy duty vehicles, or excessive idling in school pick-up areas and transit exchanges.

### REGULATE OPEN BURNING

☑ Ensure that all burning is conducted in accordance with the requirements under the *Waste Management Act* and other legislation (http://wlapwww.gov.bc.ca/air/airregs.html).

☑ Control or prohibit residential backyard burning. See the Model Municipal Bylaw for Regulating Residential Backyard Burning.

☑ Prohibit burning in residential neighbourhoods during air quality advisories due to fine particulates, except where wood is the primary heating source.

☑ Maintain and enhance urban forests and trees. In an urban environment, trees play an important role in filtering pollutants from the air and removing carbon. They also help to reduce energy consumption by providing wind-breaks and shade (see Tree Canada Foundation website http://www.tcffca.ca/programs/urbanforestry/benefits.htm).

The Regional District of Central Okanagan has a smoke control bylaw to reduce the emissions from open burning, campfires and wood burning appliances. For information see http://www.cord.bc.ca/departments/inspections/inspections_smokectrl.aspx

PHOTO: DAVE POLSTER

## 8.7.4 Best Management Practices for Developers

### CONSIDER AIR QUALITY IN DEVELOPMENT DESIGN

☑ Consider using woody debris from land clearing for habitat enhancements (see Section 4: Environmental Planning and Development at the Site Level and Section 7: Aquatic and Riparian Ecosystems) rather than creating a disposal problem through burning, chipping or hauling off to landfills.

☑ Maintain healthy urban trees to help filter particulates and contaminants from the air and to moderate temperatures (see Tree Canada Foundation website http://www.tcf-fca.ca/programs/urbanforestry/benefits.htm).

☑ Consider energy-efficient designs in buildings, such as geothermal sources for heating, solar panels, use of ambient light, higher insulation, etc. For more information see the LEED website (http://www.usgbc.org/LEED/LEED_main.asp). These practices will result in long term energy cost savings.

## 8.7.5 Useful Sources

Air quality information: http://wlapwww.gov.bc.ca/air/airquality/index.html

Air quality legislation: http://wlapwww.gov.bc.ca/air/airregs.html#1

Particulates and smoke: http://wlapwww.gov.bc.ca/air/particulates/index.html

Model Municipal Bylaw for Regulating Residential Backyard Burning: http://wlapwww.gov.bc.ca/air/particulates/pdfs/bylaw.pdf

California has prepared a draft guide to include air quality considerations in decision-making by local land use agencies—*Air Quality and Land Use Handbook: A Community*

*Health Perspective*: http://www.arb.ca.gov/programs/link97.pdf

Smart Growth B.C.: http://www.smartgrowth.bc.ca/index.cfm

## 8.8 CLIMATE CHANGE

Human activities have increased the amounts of heat-trapping gases in the atmosphere, enhancing the warming capability of the natural greenhouse effect. Land development has the potential to add to climate change effects:

- Development can reduce the amount of tree cover (that acts as a 'sink' for greenhouse gases such as carbon dioxide).
- The siting of developments will influence the amount of driving (and hence greenhouse gas production) that homeowners do. A subdivision far from services will encourage more driving than an infill development close to urban services.
- There are many building options (e.g. solar panels, geothermal heat and increased insulation) that increase energy-efficiency, and hence decrease the amount of greenhouse gas production.

Burnaby Mountain Secondary School was built with a geothermal heat pump system to reduce energy costs http://www.tbkg.com/expr01.html#.

For more information see the Climate Change website, http://wlapwww.gov.bc.ca/air/climate/.

*Climate change will be discussed in greater depth in Version 2 of this Best Management Practices document.*

## 8.9 WATER QUALITY

Protection of water quality is important for ecological and human health. Sediment from erosion (see Section 4.4.8: Erosion and Sediment Control) and other sources of contaminants can seriously impair water quality. Drinking water for many British Columbians comes from surface sources. Protection of these sources is essential.

### *8.9.1 Objectives*

The objective is to maintain good water quality by:

- Protecting water sources, through the maintenance of buffers and healthy riparian zones (see Section 7: Aquatic and Riparian Ecosystems);
- Minimizing the release of sediment and silt into the water column;
- Minimizing the discharge of stormwater into natural watercourses; and
- Encouraging the recharge of groundwater systems through the use of porous paving and other groundwater recharge systems.

### *8.9.2 Applicable Legislation*

Water quality is governed by the following legislation and regulations:

- The *Drinking Water Protection Act* (http://www.qp.gov.bc.ca/statreg/stat/D/01009_01.htm) protects drinking water quality;
- The federal government provides Drinking Water Quality Guidelines: http://www.hc-sc.gc.ca/hecs-sesc/water/publications/drinking_water_quality_guidelines/toc.htm

- The federal Water Quality Guidelines address both drinking water and the protection of aquatic life: http://www.ec.gc.ca/CEQG-RCQE/English/Ceqg/Water/default.cfm
- The *Canada Fisheries Act* (http://laws.justice.gc.ca/en/F-14/index.html) regulates the release of deleterious substances.

### 8.9.3 Best Management Practices for Developers

MAINTAIN AND ENHANCE WATER QUALITY

☑ Maintain wetlands, aquatic ecosystems and riparian areas in healthy conditions so that they can help protect water quality (see Section 7: Aquatic and Riparian Ecosystems).

☑ Control erosion and sediment generation at the source rather than trying to treat sediment-laden water (for details see Section 4.4.8: Erosion and Sediment Control)

☑ Provide effective stormwater management (see Section 4.4.7: Stormwater Management) to control pollutants entering aquatic systems. Have a system in place to address extreme rainfall events. For information see *Stormwater Planning: A Guidebook for British Columbia*, Chapter 7.

☑ Consider the use of engineered wetlands to treat stormwater prior to discharge to local streams. Storm drain systems can carry significant pollution loads from activities such as car washing, runoff from fertilised lawns, pesticides and improper disposal of solvents and oils.

### 8.9.4 Useful Sources

Water quality compendium: http://wlapwww.gov.bc.ca/wat/wq/wqhome.html

Guidelines for maintaining good water quality:
http://wlapwww.gov.bc.ca/wat/wq/B.C.guidelines/approved.html

City of Chilliwack (steps that residents can take to protect water quality):
http://www.gov.chilliwack.bc.ca/main/page.cfm?id=453

B.C. Water and Wastewater Association: http://www.bcwwa.org/index.php

## APPENDIX 8-1: DEFINITIONS

See also Glossary

Contaminated Site: An area of the land in which the soil or any groundwater lying beneath it, or the water or the underlying sediment contains (a) a hazardous waste, or (b) another prescribed substance, in quantities or concentrations exceeding prescribed risk-based or numerical criteria or standards or conditions.

Groundwater: The water that moves down into the soil and underlying geological strata following rainfall. This water may move underground by streams and seepage.

Integrated pest management: A decision-making process that uses a combination of techniques to suppress pests and that must include, but is not limited to, the following elements:

- (a) planning and managing ecosystems to prevent organisms from becoming pests;
- (b) identifying potential pest problems;
- (c) monitoring populations of pests and beneficial organisms, pest damage and environmental conditions;
- (d) using injury thresholds in making treatment decisions;
- (e) reducing pest populations to acceptable levels using strategies that may include a combination of biological, physical, cultural, mechanical, behavioural and chemical controls;
- (f) evaluating the effectiveness of treatments

Municipal solid waste: (a) refuse that originates from residential, commercial, institutional, demolition, land clearing or construction sources, or (b) refuse specified by a manager to be included in a waste management plan.

Pesticide: A micro-organism or material that is represented, sold, used or intended to be used to prevent, destroy, repel or mitigate a pest, and includes:

- (a) a plant growth regulator, plant defoliator or plant desiccant,
- (b) a control product under the *Pest Control Products Act* (Canada), other than a device that is a control product, and
- (c) a substance that is classified as a pesticide by regulation.

Remediation: "Remediation" covers all stages of contaminated site management from preliminary investigations, through implementing remediation procedures, to final monitoring.

## APPENDIX 8-2: THE FIVE STEP MANAGEMENT PROCESS FOR CONTAMINATED SITES

The five steps in dealing with contaminated sites are:

- Identifying and assessing sites;
- Investigation and determination/decision;
- Planning and determining liability;
- Remediation, including documentation of remediation completion; and
- Evaluation/monitoring.

### 1. IDENTIFYING AND ASSESSING SITES

Example of Site Profile requirements for City of Vancouver can be found at: http://www.city.vancouver.bc.ca/commsvcs/licandinsp/inspections/environment/siteprofile/

- Where there is a potential for contamination due to the history of the site, a **site profile** is prepared for use by regulators to identify potentially contaminated sites. Site profiles contain readily available information and should not require the assistance of a consultant to complete. Site profiles may be required by local governments as part of an application for subdivision, zoning, development, demolition of a structure or soil removal (at specified types of former commercial or industrial operations). Alternatively many contaminated sites are captured during due diligence investigations completed by their owners due to specific concerns or due to pending sale of the property or refinancing.
- The site profile will be **assessed by local government** to determine if the site should be subject to further investigation. If not, the site profile will be sent to the Site Registry.
- **Forms** for completing a site profile can be found at: http://wlapwww.gov.bc.ca/epd/epdpa/contam_sites/forms/index.html
- **Requirements** of local government for dealing with contaminated sites can be found at: http://wlapwww.gov.bc.ca/epd/epdpa/contam_sites/fact_sheets/5.html#top

### 2. INVESTIGATING SITES

- Where a site profile identifies the need, a **preliminary site investigation** (PSI) will be required. If contamination is identified during the PSI process, a detailed site investigation (DSI) will be required. Investigations are conducted by qualified professionals. DSIs require sampling and chemical analysis of soils, sediments, surface water and groundwater as necessary to determine when cleanup is needed and, following cleanup, satisfactory completion.

### 3. PLANNING AND DETERMINING LIABILITY

- Plans for site remediation must comply with the requirements of the Waste Management Act and the Contaminated Sites Regulation which specify that procedures satisfactory to the director must be utilised. The Ministry website (http://wlapwww.gov.bc.ca/epd/epdpa/contam_sites/index.html) provides many guidance documents and protocols that need to be adhered to.
- The regulation specifies who will be liable for clean-up.

### 4. REMEDIATION AND DOCUMENTING REMEDIATION COMPLETION

- There are several types of remediation:
  - Where contamination is to be **removed** so that it no longer remains at a site, or
  - Where contamination is dealt with through a **risk assessment**, or
  - Where contamination is **treated onsite**.
- The regulation provides standards for the quality of soils and water that remain at a site when cleanup is complete.
- **Certificates of compliance** can be issued by the Contaminated Sites Program if the standards set out in the regulations have been met. Conditional certificates of compliance can be issued if risk-based standards and related assessment procedures have been applied. In both cases, financial guarantees or other security may be required. (Note: conditional certificates may be phased out – check the Ministry website for details.)
- **Confirmatory sampling and analysis** to the satisfaction of the ministry are normally required if a certificate of compliance is to be issued. When contamination is managed onsite, certain conditions must be adhered to. These are necessary, for example, for protection of the environment or human health, or notification of future site owners, operators or adjoining owners or operators.
- A restrictive covenant may be required to be registered on the property title. However, specifications or conditions in a Conditional Certificate of Compliance and entry of notations in the Site Registry will substitute in many cases for a restrictive covenant under the *Land Titles Act*.

### 5. EVALUATION/MONITORING

- For high risk sites (sites that pose a risk to the environment, or human health and safety), complaints and compliance with certificates and orders may be undertaken by members of the Operations and Compliance Unit. Monitoring will be the responsibility of the owner of the contaminated sites and/or consultant.
- Evaluation of the monitoring information must contain a statement by a qualified professional as to the status of the site with respect to the monitoring requirements.

THIS IS PART OF A SERIES OF BEST MANAGEMENT PRACTICES DOCUMENTS

# Environmental Best Management Practices for Urban and Rural Land Development

## Glossary

June 2004

BRITISH COLUMBIA
Ministry of Water, Land and Air Protection
Ecosystem Standards and Planning
Biodiversity Branch

# Glossary

**Note:** Many of the definitions in the Glossary are derived from Dunster, J. and K. Dunster. 1996. *Dictionary of Natural Resource Management*. UBC Press, Vancouver B.C. Other sources include definitions from provincial and federal legislation and various provincial Ministry documents.

**Alien species:** Plants, animals and micro-organisms from one part of the world that are transported beyond their natural range and become established in a new area. They are sometimes also called "exotic," "introduced," "non-native," or "non-indigenous" species. Some alien species are also invasive species.

**Appropriately qualified professional:** A scientist or technologist specialising in a relevant applied science or technology including, but not necessarily limited to, agrology, forestry, biology, engineering, geomorphology, geology, hydrology, hydrogeology or landscape architecture, and who is registered in British Columbia with their appropriate professional organisation, and acting under that association's Code of Ethics and subject to disciplinary action by that association, and who, through demonstrated suitable education, experience, accreditation and knowledge relevant to the particular matter, may be reasonably relied on to provide advice within their area of expertise.

**Aquatic ecosystem:** Any body of water, such as a stream, lake, estuary or wetland, and all of the organisms and non-living components within it, functioning as a natural system.

**Biodiversity:** The variety of life on earth in all its forms including genes, species and ecosystems and the natural processes that link and maintain them.

**Bio-inventory:** A detailed site assessment that documents plant communities, aquatic and wildlife habitat values, aquatic and wildlife species presence (or likelihood of presence), sensitive ecosystems, rare ecosystems, rare species, adjacent land uses and threats, site stability and flood issues, other factors affecting lot layout, and where appropriate, potential habitat enhancement/protection opportunities. Terms of reference for a bio-inventory are included in Appendix C: Terms of Reference for a Bio-Inventory.

**Blue-listed species:** Includes any native species, subspecies or community considered to be Vulnerable (Special Concern) in British Columbia. These species are of special concern because of characteristics that make them particularly sensitive to human activities or natural events. Blue-listed species are at risk, but are not Extirpated, Endangered or Threatened.

**Buffer:** An area of land that surrounds and protects a sensitive feature from the adverse effects of activities on, or encroachments from, adjacent land.

**Connectivity:** A qualitative term describing the degree to which natural ecosystems are linked to one another to form an interconnected network. The degree of interconnectedness and the characteristics of the linkages vary in natural landscapes based on topography and natural disturbance regime. Breaking of these linkages results in ecosystem fragmentation.

**Conservation covenant:** A voluntary, written legal agreement in which a landowner promises to protect their land in specified ways. The covenant is attached to the title of land and binds future landowners to the terms of the covenant. The presence of the covenant may lower taxes by changing the assessed value of the land.

**Contaminated Site:** An area of the land in which the soil or any groundwater lying beneath it, or the water or the underlying sediment contains: (a) a hazardous waste, or (b) another prescribed substance, in quantities or concentrations exceeding prescribed risk-based or numerical criteria or standards or conditions.

**Critical habitat:** In conservation biology, critical habitat is defined as part or all of an ecosystem occupied by a species, or population of that species, that is recognised as essential for the maintenance and long-term survival of the population. In the *Species at Risk Act*, critical habitat is defined as "The habitat that is necessary for the survival or recovery of a listed wildlife species and that is identified as the species' critical habitat in the recovery strategy or in an action plan for the species" (*Species at Risk Act*, 2(1)).

**Deleterious substance:** Any substance that, if added to water, would degrade or alter the quality of the water so that it becomes damaging to fish or fish habitat, or becomes unsuitable for human consumption or any other purpose for which it is legally licensed (such as irrigation and livestock watering).

**Ecological integrity:** A continuum of characteristics that a landscape should possess. These include ecosystem health, biodiversity, stability and sustainability through the maintenance of structural and functional components of the system in perpetuity.

**Ecosystem:** The dynamic and interrelated complex of plant and animal communities and their non-living environment. All parts of an ecosystem, including physical, chemical and biological components are interconnected: that is, they affect and are affected by all other parts.

**Ecosystem features:** The physical components of the ecosystem (such as snags and large woody debris) that help maintain the diversity and processes associated with a healthy ecosystem.

**Ecosystem functions:** The physical, chemical and biological processes that keep an ecosystem operating. Examples include infiltration of surface water, evapo-transpiration and nutrient cycling.

**Edge habitat:** The point at which dissimilar plant communities (different vegetation types, successional stages or vegetative conditions) meet. Many species have adapted to the interface between the two habitats.

**Environmentally sensitive area:** A term often used loosely to mean a site or area that has environmental attributes worthy of retention or special care. A more exacting definition is: any parcel of land that already has, or with remedial action could achieve, desirable environmental attributes. These attributes contribute to the retention and/or creation of wildlife habitat, soil stability, water retention or recharge, vegetative cover and similar vital ecological functions. Environmentally sensitive areas range in size from small patches to extensive landscape features. They can include rare or common habitats, plants and animals. Environmentally sensitive areas also include hazard lands.

**Endangered:** A species facing imminent extirpation or extinction.

**Erosion:** A natural process of sediment movement as a consequence of water currents, rainfall runoff, or wind, which may be considered beneficial or detrimental, depending upon the associated environmental concerns.

**Estuary:** A partially enclosed body of water freely connected to the ocean, within which the seawater is diluted by mixing with freshwater and where tidal fluctuations affect stream water levels. The estuary is a dynamic system typified by brackish (mixed fresh and salt) water, variable and often high nutrient levels and by shallow water conditions often associated with marsh plants in upper tidal zones and eelgrass in lower tidal zones.

**Extinct:** A species that no longer exists anywhere in the world.

**Extirpated:** A species no longer existing in the wild in Canada, but occurring elsewhere. (A species listed as provincially extirpated no longer exists in the wild in British Columbia, but occurs in other parts of Canada or other parts of the world.)

**Feathering:** A method of partially trimming trees so that they are windfirm (better able to resist windthrow).

**Forests:** Groups of trees greater than 15 m in height (on average) of a minimum patch size of 0.5 ha (50m by 100m). Forests include not only live trees but also downed logs, understory plants, micro-organisms and soils that provide the fundamental structure of the forest. As forests age, their conservation value tend to increase due to the relative rarity of older forests in most parts of the province, because the diversity of habitats and species increases as the forest ages, and because many species rely on the specialised habitats that older forests provide.

**Fragmentation:** A process whereby large contiguous ecosystems are transformed into one or more smaller patches surrounded by disturbed areas.

**Grasslands:** Lands where the existing or potential natural vegetation is predominantly grasses, grass-like plants, and forbs (broad-leaved plants). Often called "steppes", these ecosystems may also contain scattered shrubs and a soil crust of lichens and mosses.

**Greenways:** Networks of linked greenspace that provide wildlife habitat and recreational opportunities. They include trails in some areas and no public access in others. Greenways are created as part of an integrated approach to land planning, balancing the needs of human communities and natural systems.

**Groundwater:** Water below the surface of the ground. This water may move through underground streams and seepages.

**Groundwater recharge:** The movement of rainwater down through the soil and into the groundwater and aquifers beneath. This groundwater provides a source of drinking water for many communities, and is also important for keeping many watercourses flowing during dry summer months.

**Habitat:** The natural home of a plant or animal within an ecosystem, which provides food and shelter and other elements critical to an organism's health and survival.

**Habitat refuge:** A small patch of habitat that provides food, shelter and/or other needs for wildlife. It may include human-modified ecosystems. They are not generally large enough to maintain the genetic diversity of a population.

**Habitat reservoir:** A large area of relatively natural habitat that has sufficient size and ecological integrity to support a range of native species, including species that need interior habitats. The size of habitat reservoir depends on the species being managed for. Habitat reservoirs are often hotspots of biodiversity in or near disturbed urban and rural landscapes.

**Hazard lands:** Lands that may be subjected to terrain hazards (flooding, landslides, debris flows, avalanches, etc.

**Hibernaculum (Plural: hibernacula):** Sheltered place where an overwintering animal rests, or a den where snakes hibernate.

**Hydrology**: The science of water, its properties and movement (water cycle) over and under land surfaces.

**Impervious surfaces:** Surfaces that prevent water from going into the ground, such as roofs, roads, parking lots and compact soils.

**Integrated pest management:** A decision making process that uses a combination of techniques to suppress pests and that must include, but is not limited to, the following species:

- planning and managing ecosystems to prevent organisms from becoming pests;
- identifying potential pest problems;
- monitoring populations of pests and beneficial organisms, pest damage and environmental conditions;
- using injury thresholds in making treatment decisions;
- reducing pest populations to acceptable levels using strategies that may include a combination of biological, physical, cultural, mechanical, behavioural and chemical controls;
- evaluating the effectiveness of treatments

**Interior habitat:** A point where edge effects no longer influence environmental conditions within an ecosystem. The effects usually involve light intensity, temperature, wind, relative humidity and snow accumulation and melt. In a forest ecosystem, edge habitat is often considered to extend at least 200 m and for some species up to 400 m from the edge of the forest, so very large patches are needed before 'interior habitat' is present.

**Invasive species:** Plants, animals and micro-organisms that colonise and take over the habitats of native species. Most invasive species are also alien (non-native) to the area, and can become predominant because the natural controls (predators, disease, etc.) that kept their populations in check in their native environment are not found in their new location.

**Islandisation:** The process by which disturbance results in an ecosystem becoming isolated from surrounding ecosystems. The remnant ecosystem becomes an 'island' in a sea of development.

**Ladder fuels:** Fuels that provide vertical continuity between ground fuels and the crowns of trees, contributing to the ease of a tree igniting.

**LEED™:** The LEED (Leadership in Energy and Environmental Design) Green Building Rating System™ is a voluntary, consensus-based national standard for developing high-performance, sustainable buildings.

**Marine sensitive zone:** Marine-sensitive zones (MSZs) include herring spawning areas, shellfish beds, marsh areas, existing aquaculture sites, juvenile salmonid rearing areas, and adult salmon holding areas. For the purposes of this document, marine sensitive zones refer primarily to estuaries and their foreshore areas.

**Municipal solid waste:** (a) Refuse that originates from residential, commercial, institutional, demolition, land clearing or construction sources, or (b) refuse specified by a manager to be included in a waste management plan.

**Naturescape:** A way of restoring, preserving and enhancing wildlife habitat in urban and rural landscapes by providing wildlife habitat in our homes and gardens. See the Naturescape website for details.

**Old fields:** Altered ecosystems, in places where agriculture once occurred but that have not been actively farmed for many years. Old fields provide important habitats for wildlife such as raptors (eagles, owls and hawks) that feed on their rich small mammal and bird populations (voles, mice, etc.). To maintain their importance as habitat, old fields may require some maintenance such as mowing, removal of invasive species, or brush cutting if succession to shrubs and trees is not desired.

**Pesticide:** A micro-organism or material that is represented, sold, used or intended to be used to prevent, destroy, repel or mitigate a pest, and includes

(a) a plant growth regulator, plant defoliator or plant desiccant,

(b) a control product under the *Pest Control Products Act* (Canada), other than a device that is a control product, and

(c) a substance that is classified as a pesticide by regulation.

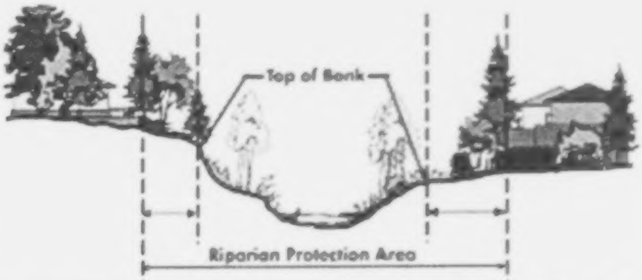
**Plant community:** A unit of vegetation with a relatively uniform species composition and physical structure. Plant communities also tend to have characteristic environmental features such as bedrock geology, soil type, topographic position, climate, and energy, nutrient and water cycles.

**Red-listed species:** Includes any indigenous species, subspecies or plant community that is Extirpated, Endangered, or Threatened in British Columbia. Extirpated species no longer exist in the wild in British Columbia, but do occur elsewhere. Endangered species are facing imminent extirpation or extinction. Threatened species are likely to become endangered if limiting factors are not reversed.

**Remediation:** "Remediation" covers all stages of contaminated site management from preliminary investigations, through implementing remediation procedures, to final monitoring.

**Restrictive covenant:** A covenant between the landowner and the Province of British Columbia (and/or local government), which restricts certain activities that may occur on that land. The covenant is registered against property title under section 219 of the *Land Title Act*.

**Riparian ecosystem:** A terrestrial ecosystem where the vegetation complex and microclimate conditions are the product of combined presence and influence of perennial and/or intermittent water, associated high water tables, and soils that exhibit some wetness characteristics. The riparian ecosystem is influenced by, and exerts an influence on, the associated aquatic ecosystem.



**Riparian protection area:** The area adjacent to a stream that may be subject to temporary, frequent or seasonal inundation, and supports plant species that are typical of an area of inundated or saturated soil conditions, and that are distinct from plant species on freely drained adjacent upland sites because of the presence of water.

**Sediment:** Material carried in suspension by a flowing body of water which will ultimately settle to the bottom as water velocity decreases.

**Soil morphology:** The form and structure of the soil, including its mineral and biological (dead organic matter) content.

**Special concern:** A species that is particularly sensitive to human activities or natural events but is not an endangered or threatened species should this be linked back to 'blue-listed/threatened?

**Special wildlife:** Wildlife species that have been identified in the British Columbia Wildlife Act, or that have been identified by Ministry of Water, Land and Air Protection as being of regional concern.

**Species at risk:** A species that has been defined as 'at risk' by either the federal or provincial government.

- Federally listed: The federal Committee on the Status of Endangered Wildlife in Canada (COSEWIC) maintains a list of species listed as extirpated, endangered, threatened or of special concern. These species are protected under the *Species at Risk Act*.
- Provincially ranked: The British Columbia government maintains a ranking of species considered to be "red-listed" and "blue-listed" in this province.

**Stream:** A natural watercourse or source of water supply, whether usually containing water or not, ground water, and a lake, river, creek, spring, ravine, swamp and gulch.

**Terrestrial herbaceous:** Ecosystems that are dominated by herbaceous vegetation, with some shrubs and low trees, often interspersed with bare rock outcrops especially on steeper terrain. They are typically on a smaller scale than grasslands, and include natural meadows, grassy or mossy hilltops and rocky outcrops. They are typically south facing characterised by shallow, rapidly draining soil conditions and exposure to light and heat.

**Threatened:** A species likely to become endangered if limiting factors are not reversed.

**Top of bank:** The points closest to the natural boundary (or high water mark) of a watercourse where a break in slope occurs such that the grade beyond the break is flatter than 3 (horizontal) to 1 (vertical) for a minimum of 15 metres measured perpendicularly from the watercourse. Small slopes beyond the initial break in slope that are steeper than 3:1 but are less than 1 metre in height can be included in the determination of the 15 metre distance from the top of bank. Where banks are not well defined (e.g. in the case of lakes, wetlands or ponds), the top of the bank is equivalent to the natural boundary or seasonal high water mark. See also Riparian Protection Area.

**Vernal pool:** A temporary body of freshwater that is filled by spring rains and snowmelt, only to dry up during the hot, dry summer months. Many vernal pools are filled again by autumn rains, and may persist throughout the winter.

**Wetland**: Land that is inundated or saturated by surface or groundwater at a frequency and duration sufficient to support vegetation typically adapted for life in saturated soil conditions, including swamps, marshes, bogs, fens, vernal pools and estuaries.

**Wildlife**: Any wild organism including wild mammals, birds, reptiles, amphibians, fishes, invertebrates, plants, fungi, algae and bacteria.

**Wildlife corridor**: A travel corridor for wildlife. This ranges from very wide, natural corridors for large mammals, to 'sky corridors' that offer a safe flight path between feeding and resting places for birds, to smaller man-made corridors (such as urban trails) that provide safe passage for smaller creatures. These corridors also provide year-round habitat for less mobile species.

**Wildlife Management Area:** Land that has been designated as a wildlife management area under the B.C. *Wildlife Act.*

**Wildlife trees:** A standing live or dead tree with special characteristics that provide valuable habitat for the conservation or enhancement of wildlife. Characteristics include large diameter and height for the site, current use by wildlife, declining or dead condition, value as a species, valuable location and relative scarcity.

**Windthrow:** A tree or trees uprooted or broken off by the wind. Also known as blowdown.

**Woody debris:** Sound or rotting logs, stumps or large branches that have fallen or been cut and left in the woods or water; or trees and branches that have died but remain standing or leaning. These provide cover for small animals and their predators (both fish and wildlife).

**Xeriscaping:** A landscaping approach using plant species that are tolerant of drought conditions.

**Yellow-listed species:** All species not included on the British Columbia Red or Blue lists. Some of these yellow-listed species are considered to be of conservation concern because they have a small range or low abundance in the province, because they have shown provincial declines, or there are perceived long-term threats.

THIS IS PART OF A SERIES OF BEST MANAGEMENT PRACTICES DOCUMENTS

# Environmental Best Management Practices for Urban and Rural Land Development

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June 2004

BRITISH COLUMBIA
Ministry of Water, Land and Air Protection
Ecosystem Standards and Planning
Biodiversity Branch

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Canada *Pest Control Products Act*: http://laws.justice.gc.ca/en/P-9/

Canada *Species at Risk Act*: http://www.sararegistry.gc.ca/ (general information) or http://laws.justice.gc.ca/en/S-15.3/index.html (copy of the Act)

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**B.C. Lake Stewardship Society:** http://www.nalms.org/bclss/

**B.C. Species Explorer:** http://srmwww.gov.bc.ca/atrisk/toolintro.html (British Columbia's species at risk)

**Bear Management:** http://wlapwww.gov.bc.ca/eeeb/info/bearaware/home/index.htm

**Climate Change:** http://wlapwww.gov.bc.ca/air/climate/

**Committee on the Status of Endangered Wildlife in Canada** (COSEWIC): http://www.cosewic.gc.ca/eng/sct5/index_e.cfm (Canadian species at risk)

**Eco-gifting:** http://www.cws-scf.ec.gc.ca/ecogifts/intro_e.cfm

**Endangered Species and Ecosystems:** http://srmwww.gov.bc.ca/atrisk/

**Garry Oak Ecosystem Recovery Team:** http://www.goert.ca/

**Green Buildings B.C. program:** http://www.greenbuildingsbc.com/

**Groundwater:** http://wlapwww.gov.bc.ca/wat/gws/index.html

**Fish:**

Fish Wizard http://www.fishwizard.com/;

Fisheries Inventory Summary System (FISS) http://www.bcfisheries.gov.bc.ca/fishinv/fiss.html

**Floodplain Mapping Program:** http://srmwww.gov.bc.ca/aib/fpm/

**Heron Working Group:** http://www.heronworkinggroup.org/abouthwg.html

**Institute of Urban Ecology:** http://www.douglas.bc.ca/iue/about.htm

**Integrated Pest Management Control website:** http://wlapwww.gov.bc.ca/epd/epdpa/ipmp/

**Land Trust organisations:** http://www.landtrustalliance.bc.ca/

LEED (**Leadership in Energy and Environmental Design**) Green Building Rating System™: http://www.usgbc.org/LEED/LEED_main.asp

**Naturescape British Columbia:** http://wlapwww.gov.bc.ca/hctf/naturescape/about.htm

**Provincial spill notification overview:** http://wlapwww.gov.bc.ca/eeeb/spillnoti/notifica.html

**Pacific Streamkeepers Federation:** http://www.pskf.ca/

**Sensitive Ecosystems Inventories:** http://srmwww.gov.bc.ca/sei/index.html

**Smart Growth B.C.:** www.smartgrowth.bc.ca

**South Okanagan-Similkameen Conservation Program:** http://www.soscp.org/

**Solid Waste:** http://wlapwww.gov.bc.ca/epd/epdpa/mpp/solid_waste_index.html

**Species at Risk Recovery Planning** in British Columbia website: http://wlapwww.gov.bc.ca/wld/recoveryplans/rcvry1.htm

**Species and Ecosystems at Risk** website: http://wlapwww.gov.bc.ca/wld/serisk.htm

**Stormwater Runoff:** http://wlapwww.gov.bc.ca/wat/wq/nps/NPS_Pollution/Stormwater_Runoff/SW_Main.htm

**Water Balance Model:** http://www.waterbalance.ca

**Water Quality:** http://wlapwww.gov.bc.ca/wat/wq/wqhome.html

**Wetlandkeepers:** http://www.naturalists.bc.ca/fbcn_bn/bn9910-7.htm

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THIS IS PART OF A SERIES OF BEST MANAGEMENT PRACTICES DOCUMENTS

Environmental Best Management Practices
for Urban and Rural Land Development

A

June 2004

## Appendix A
## BENEFITS OF ENVIRONMENTAL PROTECTION

BRITISH COLUMBIA
Ministry of Water, Land and Air Protection
Ecosystem Standards and Planning
Biodiversity Branch

# Appendix A:
# The Benefits of Environmental Protection

"For Canadians of all ages, protecting the environment is not an option—it is something that we simply must do. It is a fundamental value—beyond debate, beyond discussion" (*Paul Martin 2001*).

"Mounting environmental regulations and increasing costs force us to look at the more efficient alternatives that minimise costs and negative effects on the site and the area around it. Multiple benefits can result from this sensitive site planning approach. Lower overall development costs, higher lot and unit process, advanced lot and unit sales, improved corporate image and faster approvals are some of the possible benefits" (*von Hausen 2004*).

Good environmental planning at the community level can take time and money—but the investment will pay for itself in a better quality of life, savings in infrastructure and liability costs, and payback from increased property values. It is "something we simply must do"— for the benefits of the plants and animals that share our communities with us, AND for the benefits it provides to local governments, developers and the community as a whole.

## BENEFITS FOR LOCAL GOVERNMENTS

### *Free ecosystem services*

Natural ecosystems provide a range of free 'ecological services' (water and air purification, mosquito and pest control, etc.) that would otherwise have to be paid for by local governments and residents.

Coastal wetland contributes from US$800 to $9000 per acre to the local economy through recreation, fishing and flood protection (*Kirkby 1993*).

- **Stormwater management:** Streams, wetlands and riparian vegetation can dramatically reduce the need for expensive storm sewer infrastructure. Johnson County in Kansas saved an estimated US$120 million on engineered stormwater controls by setting aside US$600,000 worth of riparian greenways (*Sandborn 1996*).
- **Trees and other vegetation reduce stormwater runoff.** For every 1,000 trees, stormwater runoff is reduced by nearly 3.8 million litres (*Center for Urban Forest Research 2003*).
- **Improved air quality:** A study by American Forests found that the Puget Sound region has lost 37% of its high vegetation and tree canopy coverage over the past 25 years. This lost tree canopy would have removed about 35 million pounds (13,000,000 kg) of pollutants from the atmosphere annually, at a value of approximately US$95 million dollars (*American Forests 1998*).
- **Trees in parking lots moderate the heat absorbed by asphalt.** This lowers the air temperature, which reduces ozone concentrations by lowering hydrocarbon emissions (*Scott et al 1999*).
- **Energy savings:** A study in California found that planting shade trees could reduce the need for power plants—50 million shade trees planted in strategic, energy-saving

locations could eliminate the need for seven 100-megawatt power plants (*Simpson and McPherson 1998*).

### *Community improvement*

- Enhanced property values associated with green space retention leads to greater tax revenues and therefore the ability to provide enhanced municipal services. Higher property values resulting from greenspace acquisition in a Boulder, Colorado neighbourhood increased property taxes sufficiently to pay back the acquisition costs in just a few years (*Sandborn 1996*).
- Community greenspace is an important part of the viewscapes that make a community attractive.

### *Attract new business*

- "Footloose" businesses (that can locate anywhere) are attracted by communities that offer a high quality of life for their employees. Greenspace, environmental protection and recreational opportunities are often an important part of that choice. Places such as Sacramento, California and Boulder, Colorado, vigorously promote their urban greenspaces to attract new business (*Sandborn 1996*).
- Eco-tourism is a rapidly growing industry for which the protection of the natural environment is vital. In 1996, 2,500,000 British Columbians participated in nature-related activities, spending a total of $1,938 million and creating 34,100 jobs (*Environment Canada 2000*).
- People are attracted to areas with natural beauty and outdoor recreation opportunities. A study of visitors to Vancouver Island (summer 2003) found that visitors were very pleased with the vacation experience, in part because of the scenic beauty (98.7%) and outdoor recreation opportunities (91.5%) (*Malaspina University College and Tourism Vancouver Island 2003*).

### *Reduce costs, increase revenues*

- Where one part of a site is densified to enable protection of another part of the site, there are lower costs for roads and servicing. This means lower long-term costs of maintaining these roads and services.
- There are savings in mowing and maintenance costs when lands are managed as a natural buffer rather than manicured lawn. For corporate landowners (including local governments), this can save an estimated US$270 to $640 per acre per year (CDN$150 to $350 per hectare per year) (*Wildlife Habitat Enhancement Council 1992*)
- The net property tax benefit of open space is greater than for developed lands. Agricultural land and open space pays significantly more in taxes than it requires in servicing from local governments (*Curran 2001*). Although developed land contributes more in property taxes, there are higher servicing costs for road, libraries, schools, etc.

### Avoid future costs

- Good environmental planning prevents development on hazard lands and other sites that are unsuitable for development. This may prevent expensive and time-consuming lawsuits if problems arise.
- There can be substantial costs of NOT protecting the environment. One Lower Mainland community removed riparian buffer vegetation and subsequently suffered stormwater flooding damage of about $2.5 million (*Cullington 1999*).

## SUPPORT DECISION MAKING

### Environmental planning can:

- Assist local and senior governments with park acquisition decisions;
- Assist with siting transportation and utility corridors in places with least impact on sensitive habitats;
- Help to define zoning, bylaws, and the configuration of future urban growth areas and urban containment boundaries; and
- Identify the location of greenways and other wildlife movement corridors, especially where they are not associated with stream corridors. Connectivity is important in maintaining genetic diversity, as it allows interbreeding between different populations, and in maintaining species diversity, as it allows the species to move between habitats.

## BENEFITS FOR THE DEVELOPMENT COMMUNITY

### Community environmental plans lead to greater certainty

- Developers benefit from greater certainty if they know in advance that part of a development site is deemed to be an environmentally sensitive area. They can then account for this in site development plans and avoid wasted time and expense in disputes over proposed development of this land.
- Developers can identify unconstrained or lightly constrained development areas, so that phased developments have the potential to start and recover monies on areas with lower overhead first.
- Developers can use the community-level environmental information to direct their needs for technical expertise in developing the site-level inventory.

### Save money

- Development costs are lower per unit for higher density developments. If housing units are clustered on one portion of a site in order to protect an environmentally sensitive area, there are cost savings of 10–33% because there is less area to be cleared, less infrastructure (roads, sewers, etc.). Cluster development can reduce the capital cost of subdivision development by 10 to 33%, primarily by reducing the length of infrastructure needed to service the development (*Schueler 1995*).

### Increase sale values

- Property values are higher next to greenspace. A study of properties in the Lower

Mainland and south Vancouver Island found that residential property values increase by 15–20% when close to greenways (*Quayle and Hamilton 1999*).

### *Increase marketability*

- The ability to incorporate special environmental features into the community plans provides unique neighbourhoods based on the local features (e.g. "Heronwoods" where a local heron rookery is preserved in an adjacent woodland).
- The U.S. National Association of Home Builders has encouraged the planting of trees because it increases the marketability of new developments (*Petit 1998*).

### *Faster approvals*

- Where new developments fit into the community environmental plan, the development is likely to move more quickly through the approvals process and encounter less community resistance. This translates into time and cost savings for the developer.

> "Clean air, fresh water, the sun rising through the mist on a mountain lake, an abundance of life on the land, in the air, and in the sea—the value of these things is incalculable." (*Al Gore 1992*)

## BENEFITS FOR RESIDENTS

### *Quality of life*

- Residents benefit from a well planned community through the enjoyment of wildlife and natural areas. Lots of greenspace creates pleasant viewscapes throughout the community.

### *Health*

- Having community greenspace encourages walking, which is good for physical fitness. It also provides spaces for 're-creation' and restoration of mental health in an often hectic lifestyle.
- Natural areas provide ecosystem services that clean the air, clean the water and allow for groundwater recharge.

### *Sense of community*

- People who live near greenways tend to live in their houses longer than those who do not. This lower turnover rate results in more stable neighbourhoods and a greater sense of community (*Quayle and Hamilton 1999*).
- Developing the community environmental plan provides an opportunity for the public to become involved in their community planning, and to assist with the identification of important natural areas.

### *Clean air*

- Urban forests improve air quality by reducing atmospheric carbon dioxide levels and absorbing air pollutants (McPherson et al 1996).

### Clean Water

- Wetlands filter pollutants from stormwater before the water reaches streams and creeks.

### Recreational opportunities

- Natural open spaces and walking/biking paths can be among the most important features in a residential neighbourhood (*Warrick and Alexander 1997*).

### Reduce costs

- Properly located trees can reduce the costs of heating a home in winter (because of the windbreak effect) and reduce air conditioning costs in summer (because of the shade) (Center for Urban Forest Research website).

## FOR MORE INFORMATION ON THE BENEFITS OF ENVIRONMENTAL PLANNING:

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Environmental Best Management Practices
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B

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# Appendix B

# SOURCES FOR ENVIRONMENTAL MAPPING AND INVENTORY

BRITISH COLUMBIA
Ministry of Water, Land and Air Protection
Ecosystem Standards and Planning
Biodiversity Branch

# APPENDIX B:
# Sources for Environmental Mapping and Inventory

Many sources of environmental mapping and inventory are now available electronically. Some of these are compilations of data from several different sources, with the ability to produce maps showing only the information layers of interest. Some of these sources require that you download a mapping tool such as MapGuide, and some require a password.

Below is a summary of some of the electronically available information. Note that this list is likely incomplete, as new information frequently becomes available. As well, much important information is NOT yet available in digital format. When seeking out information on a given area, remember to search for reports, local mapping initiatives and other data sources. Local government, provincial and federal government agencies, and community conservation groups may be able to help identify additional information sources.

## PROVINCE-WIDE MAPPING AND INVENTORY

**Land Information B.C.** provides an Endangered Species and Ecosystems website (http://srmwww.gov.bc.ca/atrisk/index.html) with links to provincial data sources:

- Get detailed information on rare and endangered species and ecosystems in BC through the **BC Species and Ecosystems Explorer** (http://srmwww.gov.bc.ca/atrisk/toolintro.html). Information includes status, distribution, life histories, conservation needs, recovery plans and more.
- Generate lists of BC plant and animal species and ecosystems and link to related documents. **BC Species and Ecosystems Explorer** (http://srmwww.gov.bc.ca/atrisk/toolintro.html). BC Species and Ecosystems Explorer;
- Use the **NatureServe Explorer** (http://www.natureserve.org/explorer/) to find national and global information about species in BC and beyond.
- Use **Mapped Known Locations** (http://srmwww.gov.bc.ca/atrisk/ims.htm) to find complete records for known locations of Red- and Blue-listed species and ecosystems.

Many environmental atlases are available on-line through the Community Mapping Network (http://www.shim.bc.ca/), including:

- B.C. Grasslands Atlas: http://www.shim.bc.ca/grassland/grassland_public.htm
- B.C. Watershed Statistics Atlas: http://www.shim.bc.ca/BCWsheds/main.htm
- B.C. Wetlands Atlas: http://www.shim.bc.ca/wetland/main.htm
- Wildlife Atlas: http://www.shim.bc.ca/wildlife/wildlife_entry.htm
- Wildlife Tree Stewardship Atlas: http://www.shim.bc.ca/wits2/loginscreen.cfm

**Sensitive Ecosystems Inventories** (http://srmwww.gov.bc.ca/sei/index.html) are currently available for East Vancouver Island and Gulf Islands; Sunshine Coast; Bowen and Gambier Islands; Central Okanagan; and Bella Vista Goose Lake (North Okanagan).

For information on **nest site** data and annual monitoring reports for bird species identified in Section 34 of the *Wildlife Act*, including Great Blue Heron, Bald and Golden Eagle, contact regional Ministry of Water, Land and Air Protection personnel.

**Fish and Fish Habitat Inventory Reports** (http://srmwww.gov.bc.ca/fish/ric/): listing of available fish and fish habitat inventory reports.

**Fish Wizard** http://www.fishwizard.com/

**Fisheries Inventory Summary System** (FISS):
http://www.bcfisheries.gov.bc.ca/fishinv/fiss.html

**Sensitive Habitat Inventory and Mapping** data:
http://www.shim.bc.ca/shim/shimloginscreen2.htm

**Eelgrass Bed Mapping Atlas:** http://www.shim.bc.ca/eelgrass/main.htm

**Terrain stability** mapping:
(http://srmwww.gov.bc.ca/terrain/inventory/stability/index.html

**Floodplain** mapping: http://srmwww.gov.bc.ca/aib/fpm/

The Ministry of Sustainable Resource Management maintains and manages several land use and resource inventory information systems. These systems constitute a record of land, mineral, vegetative and other natural resources of the Province, as well as the rights, tenures and activities of those that use these resources. This information is being compiled in an integrated **Land and Resource Data Warehouse**. For more information, see http://srmwww.gov.bc.ca/imb/2serv/dr_pub_prod/data-warehouse.html

## REGIONAL MAPPING AND INVENTORY

Many regional of the environmental atlases are available on-line through the Community Mapping Network (http://www.shim.bc.ca/), including:

- Boundary Bay Atlas: http://www.shim.bc.ca/bb/main.htm
- Capital Regional District Natural Areas Atlas: http://www.crd.bc.ca/es/natatlas/atlas.htm
- Central Coast Watershed Atlas: http://www.shim.bc.ca/centralcoast/main.htm
- Comox Valley Project Watershed Society: http://www.shim.bc.ca/projectwatershed/main.htm
- Comox Strathcona Sensitive Habitat Atlas: http://www.rdcs.bc.ca/environmentalplanning/index.html
- Fraser Valley Regional District Habitat Atlas: http://www.shim.bc.ca/fvrd/main.htm
- Inner Coast Natural Resource Centre (ICNRC): http://www.icnrc.org/
- ICNRC Stream Observation Mapping Tool: http://www.shim.bc.ca/icnrc/main.htm
- Invasive Species in Langley B.C.: http://www.shim.bc.ca/invasivespecies/main.cfm
- Pacific Coastal Resources Atlas: http://www.shim.bc.ca/Coastal/Coastal_entry.htm
- Sea To Sky Atlas: http://www.shim.bc.ca/sea2sky/main.htm
- Shorekeepers Atlas: http://www.keepersweb.org/Shorekeepers/index.htm
- South Coast Cutthroat Atlas: http://www.shim.bc.ca/cutthroat/main.htm

- Sunshine Coast Habitat Atlas: http://habitat.scrd.bc.ca/
- The Spirit of Georgia Strait Alliance: http://www.shim.bc.ca/gsa/bridge.htm
- Upper Skeena Atlas: http://www.shim.bc.ca/skeena/main.htm

**Habitat Atlas for Wildlife at Risk, Thompson-Okanagan Region:**
http://wlapwww.gov.bc.ca/sir/fwh/wld/atlas/ecosystems/ecosystems_index.html

Also check regional Ministry of Water, Land and Air Protection websites (http://wlapwww.gov.bc.ca/main/prgs/regions.htm) for local information.

Environmental Best Management Practices
for Urban and Rural Land Development

C

June 2004

# Appendix C

# TERMS OF REFERENCE FOR BIO-INVENTORY

BRITISH COLUMBIA
Ministry of Water, Land and Air Protection
Ecosystem Standards and Planning
Biodiversity Branch

# APPENDIX C: Terms of Reference for Bio-inventory

## C.1 INTRODUCTION

The Ministry of Water, Land and Air Protection recommends a bio-inventory assessment of a site when there is insufficient information to make appropriate recommendations:

- for lot layout design and prescriptions to best protect fish and wildlife habitat and environmentally sensitive areas; and/or
- for compensation for permanent habitat loss or degradation associated with, or adjacent to, a proposed development.

The bio-inventory should document plant communities, aquatic and wildlife habitat values, aquatic and wildlife species presence, environmentally sensitive areas, sensitive ecosystems and rare species, adjacent land uses and threats, site stability and flood issues or other factors affecting lot layout and, where appropriate, potential habitat enhancement/protection opportunities.

To minimise controversy related to the biases and/or accuracy of the report produced, the Ministry recommends that the local government hire the consultant(s) and oversee the inventory work, but that the proponent pay the cost of this service.

Two levels of bio-inventory should be considered based on setting (rural or urban) and parcel size:

- Site Quality Survey; and
- Detailed Bio-inventory.

## C.2 SITE QUALITY SURVEY

A Site Quality Survey is intended for all sites over two hectares but under ten hectares OR on smaller sites where the potential exists for the proposed development to destroy a sensitive ecosystem. In any of these situations, the Site Quality Survey is a tool to determine whether a more detailed bio-inventory is appropriate.

The first stage is to review all existing information for the area, including historical and current aerial photographs and reported occurrences of rare species/plant communities/ecosystems. Check existing inventory data sources for any available information about the property and surrounding area. The Land Information website (http://www.gov.bc.ca/bvprd/bc/keyInitiativeHome.do?action=landInfoBCUser&navId=NAV_ID_province) provides access to a number of inventory data sources from the Ministry of Water, Land and Air Protection and Ministry of Sustainable Resource Management. Local governments and environmental organisations may also have inventory information such as habitat atlases.

### *Step One - What is the quality of the upland habitat?*

- A site that has been extensively modified (e.g. recently logged or cleared) may only need limited field assessments. However, any remnant patches of relatively undisturbed natural vegetation (e.g. older forests, remnant veteran trees, wetlands, rocky outcroppings) may provide habitat for rare animals, plants and plant communities and should be inventoried.
- A site that was originally farmed but has been fallow for many years may have patches or extensive areas of old-field habitat such as native hawthorn and similar shrub species, as well as the potential for the presence of rare and endangered species and communities. Seasonally flooded fields, ditches and channelised watercourses may have re-established important habitat features that should be inventoried for fish, wildlife and rare plants.
- If the site is a re-development, the environmental values may vary from extremely compromised in the case of paved and/or manicured properties, to high values on old estates with relatively undisturbed plant communities or wildlife habitat patches. Proponents are encouraged to design the inventory process accordingly.
- If the identified environmental features will be protected pursuant to a return to Crown or equivalent protection, and human disturbance prevented during and after site development, a detailed bio-inventory of that area may not be necessary. However, if the final lot layout is uncertain or sensitive habitats may be adversely impacted during development, we recommend that a Detailed Bio-inventory be undertaken so that future conflict or loss of valuable habitat features can be avoided or minimised.

### *Step Two - Look for the presence of watercourses*

All watercourses, including ephemeral channels, should be noted and considered in aquatic and riparian habitat and stormwater assessments. Changing natural drainage patterns may adversely affect adjacent plant communities and fish habitat.

- If existing inventories indicate the presence of fish in nearby reaches of the watercourse, no fish inventory may be necessary. However, aquatic and stream reach information may still need to be collected if changes (e.g. relocation or bridge construction) are being considered to the existing watercourse.
- If fish presence in the watercourse is unconfirmed and a developer wishes to have the site designated as non-fish-bearing, a detailed inventory, conducted over an extended period of time, will be needed to conclusively prove that the watercourse is non-fish-bearing. Refer to the "Terms of Reference for a Watercourse Bio-Inventory" (http://srmwww.gov.bc.ca/sry/csd/downloads/forms/environmentalmonitoring_assessments/watercoursebio-invtor-i.pdf).
- In addition to fish presence, wetlands should be inventoried for all values including amphibians, plant communities, invertebrates, and rare species. Any proposals to alter wetlands to enhance fish habitat or for stormwater management should consider all other values and the implications on those resources (such as turtle breeding sites, amphibian habitat, etc.).

### Step Three – Assess Wildlife Utilisation

- If high wildlife values are associated with the site (such as ungulate wintering ranges, wildlife trees, raptor nests, wildlife travel corridors, or prime predator feeding areas), these features should be assessed in the field.
- Consider how changes to soil moisture, caused by roads and servicing, may affect sensitive vegetation.

### Step Four – Field Work and Report Out

- All field work should be carried out by one or more appropriately qualified professionals.
- The field review should reference and locate all dominant plant communities, significant features such as veteran trees, raptor and heron nests, areas used by large predators, sensitive ecosystems and areas potentially containing rare species on a map of a scale of 1:5,000 or larger. This information should be used to determine appropriate lot layouts that will minimize loss of ecosystem function or productivity.
- The Site Quality Survey should be reviewed by local government staff to help determine if the development proposal (layout, density, land use) is suitable for the proposed site. This includes an assessment of the risks associated with allowing development adjacent to or within prime predator habitats or travel corridors that may result in conflicts with humans after the site is developed.

## C.3 DETAILED BIO-INVENTORY

The detailed bio-inventory should document plant communities, aquatic and wildlife habitat values, aquatic and wildlife species presence, sensitive ecosystems and rare species, site stability and flood issues, other environmental features affecting lot layout and development potential. Where appropriate, potential habitat enhancement and mitigation opportunities should also be identified.

A bio-inventory should be carried out by one or more appropriately qualified professionals depending on the specific features being assessed and the qualifications of the professionals involved.

### C.3.1 Terrestrial Habitats and Species

#### PLANT COMMUNITIES:

One of the first steps in the bio-inventory is to map the various plant communities on site. This will allow the consulting team to focus their attention on those areas most likely to support wildlife or rare/uncommon species.

#### WILDLIFE:

- A presence/not detected survey should be carried out to identify vertebrate species on the site.

- A survey should be conducted to locate all raptor or heron nest sites on or adjacent to the property. Location and date-stamped photo-documentation should be detailed for each nest site. Once identified, nesting sites should not be disturbed during the nesting season. Herons are particularly susceptible to disturbance during that time and have been known to permanently abandon a colony that has been established for many years.
- Conduct an inventory for other wildlife species (including large predators, reptiles and amphibians) that could be reasonably expected to occur on the site.

### *C.3.2 Rare and Endangered Species and Plant Communities*

Many aquatic and terrestrial habitats in British Columbia support threatened, rare or endangered (red-listed), and vulnerable (blue-listed) species and ecosystems. Areas with the potential to support red- and/or blue-listed mammal, bird, or invertebrate species should be assessed for the presence of those species in the appropriate seasons. Every effort should be made to identify the species in the field. If voucher specimens are needed for identification or confirmation of a species in an area, please follow the Resource Inventory Standards Committee (RISC) standards for Voucher Specimen Collection in "Standards for Components for BC's Biodiversity No. 4a and 4b" (http://srmwww.gov.bc.ca/risc/standards.htm). Complete the Conservation Data Centres Rare Element Observation Forms (http://srmwww.gov.bc.ca/cdc/contribute.html) when rare species and/or plant communities are detected.

Where Sensitive Ecosystem Inventories (SEIs) have been carried out (East Coast Vancouver Island and Gulf Islands; Sunshine Coast, and Central Okanagan) (http://srmwww.gov.bc.ca/sei/index.html), these ecosystems should also be identified. Sensitive ecosystems not mapped during the Sensitive Ecosystems Inventories due to their small size (under 0.5 ha) should also be identified.

### *C.3.3 Aquatic Habitats and Species*

#### FRESHWATER RESOURCES:

All aquatic systems have biological values: from lakes to ephemeral streams, storm ditches to dug ponds and winter wetlands. The assessment needs to start out by mapping all channels, wet or dry, which are components of the local drainage system if not already correctly located on large scale maps. Even isolated winter wetlands are components in the hydrologic regime of a site, as well as potentially supporting ecologically valuable species. Map the normal seasonally high water levels as well as flood levels for development layout considerations.

#### WETLANDS:

Detailed information on the various components of a wetland are needed, especially if the proposal involves draining, filling, changing the natural water levels for use as an aesthetic feature or for stormwater retention, or affecting the flow regime due to stormflow patterns and water quality changes. The first stage is a detailed mapping and analysis of the watershed affecting the wetland, plus its peak water level and areal extent at peak storms (topographical mapping is useful here). The bio-inventory should consider water quality for all seasons, flow regimes, aquatic organisms (from fish to amphibians to Daphnia), plants and plant communities (submergent, emergent, ephemeral and riparian communities), and soils.

**NOTE REGARDING INSTREAM WORKS:**

Any proposed changes to any watercourse, including road or pipeline crossings, water storage structures, dredging, or instream works, are covered by the *Water Act*. Acceptance of this bio-inventory or other aspects of the development proposal does not preclude the need to apply for the appropriate *Water Act* approval. (Nor does an approval under the *Water Act* constitute an acceptance of other aspects of a development, such as lot layout.) If the watercourse is fish-bearing or fish resources are present downstream, also contact Fisheries and Oceans Canada to ensure compliance with the *Fisheries Act.*

**MARINE COASTAL SITES:**

Proposals involving potential changes below the high tide line need to be referred to Fisheries and Oceans Canada, as well as Land and Water BC. Proposed changes to the nearshore habitats, or within 100 m of an estuary, should be included in this bio-inventory, as part of the "Terrestrial Habitats and Species" component.

### C.3.4 Development Impact Assessment

The development impact assessment should identify flood and terrain hazard issues, potential hydrologic changes, any risks from the proposed layout or from the cumulative effects of this development combined with other developments in the watershed, and how the environmental features will be protected.

An analysis of the impact of the proposed development upon the habitats present on the site should include (but not necessarily be limited to) the following points:

**AREA:**

- Is this site in a natural state (naturally vegetated vs. cleared)? Are there significant trees or treed areas?
- Are there signs of instability (steep slopes, landslides, windthrow) that could be aggravated by the development?
- Is there land outside of the identified biological features for a reasonable building envelope on each proposed lot? ("Reasonable" as determined by site constraints, average size/footprint of buildings and setbacks, with room for normal "yard" activities)?

- Do the species at risk require a buffer to maintain their use of a site; and if so, how large? Is the site large enough to accommodate the recommended buffers with the development as proposed?

SITE CONSTRAINTS:

- Are there significant constraints posed by topography, other environmental features or rights-of- way on the developable portion of the site?
- Have options been explored that would locate proposed structure(s) away from the sensitive areas or provide for alternative layout options and /or design structures that adapt to the need for habitat protection?
- If development is proposed to the edge of the recommended buffer, has fencing or another exclusion technique been employed?

### *C.3.5 Report Composition*

The report should include maps at two scales:

- **Location Map** (e.g. 1:10,000 scale)—shows the property in relationship to easily identifiable landmarks and roads.
- **Specific Maps** (1:5,000 scale or larger)—shows the property's environmental features overlaid on the most current cadastral map. To keep the map from being too 'busy', additional digital layers or Mylars should be provided. The map legend should show clear descriptions of all symbols used on the map (e.g. reach break symbol) as per RISC standards.

The following information should be included:

1. Contours at 1 metre intervals or as appropriate for the size of the development;
2. Survey data collection points and transects;
3. Dominant and rare plant communities and sensitive ecosystem polygons;
4. Raptor/heron nest/roost sites and other important wildlife features;
5. Wildlife species capture or identification sites (including major use areas for nesting, bedding, migration routes, etc.);
6. Threatened, rare or endangered species capture or observation sites;
7. Wetlands and watercourses including ditches and ephemeral streams;
8. Aquatic habitat features including fish distribution and obstructions;
9. 'Top of bank', and/or distance from the 'natural boundary', for the portions of the development that would be affected by setbacks and buffers; and
10. Potential or known threat sources (e.g. adjacent logging or property slated for intensive housing project).

## C.4 SELECTING ENVIRONMENTAL CONTRACTORS

**MWLAP cannot recommend specific environmental consultants and monitors. This is not our role. It is the responsibility of the developer and/or land development approving agency or authority to assess the qualifications of consultants.**

Visit the Association of Registered Professional Biologists website for further information regarding registered biologists standards and qualifications: http://www.apbbc.bc.ca/. Please also note links concerning the College of Applied Biology at http://www.cab-bc.org/.